METALLURGICAL EVALUATION 1978-1981

by

KAPPES, CASSIDAY & ASSOCIATES

July 6, 1982

The Gilt Edge deposit is both metallurgically and geologically complex. The problems of this evaluation are compounded by the presence of coarse gold, which makes interpretation of individual test results very difficult. This report is an attempt to summarize a massive amount of data, which is presented in the various other reports and laboratory studies, referred to throughout this report.

Submitted by,

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DWK/df

REPORT 1982 C

SUMMARY REPORT

METALLURGICAL EVALUATION 1978-1981

GILT EDGE, SOUTH DAKOTA

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SUMMARY REPORT

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CONCLUSIONS

The metallurgical test work which has been performed on the Gilt Edge ores since 1978 has largely concentrated on examining the ores for their amenability for heap leaching, but preliminary data has also been generated on mill recoveries. The results of this work can be summarized as follows:

Oxidized Ores: Heap Leach Potential. Both the Sunday Zone and Dakota Maid Zone oxidized ores are heap leachable, with recoveries averaging 70 percent of contained gold when the ore is crushed to 2-inches or less. The Sunday Zone appears to show slightly higher recoveries than the Dakota Maid Zone (73 percent versus 67 percent). The oxidized ore represents approximately 1,500,000 tons of material at an average grade of 0.06 oz gold per ton. It can be mined at a stripping ratio on 3.0:1. By itself, it could be the basis for a small-sized mine/ heap leach operation.

Unoxidized Ores: Heap Leach Potential. The heap leach behavior of the unoxidized ore is highly variable. Average recovery from highly pyritic ores appears to be approximately 30 percent, and from all ores classed as "unoxidized", 45 - 50 percent, in a heap leach system when crushed to 2-inches or finer.

Even more so than with the oxidized ores, the Sunday Zone unoxidized material shows better recoveries than that from the Dakota Maid: general recovery from all unoxidized ores in the Dakota Maid Zone will be in the range of 30 - 45 percent, whereas Sunday Zone material will be in the range 45 - 60 percent.

Recovery Potential in Conventional Cyanide Mill. Average recovery in agitated tests, which reflect the recoveries in a conventional mill at medium grind sizes, is 76 percent of contained gold.

The laboratory test results indicate that mill recoveries from the remaining ore will be similar to recovery in the historic mills, which operated on the property in the late 1930's. A March 1968 report by Dolf Fieldman gives recoveries in the 1937-1940 period as "approximately 75 percent".

Improved recovery may be possible with very fine grinding, or with a combined flotation/cyanidation circuit. These studies were beyond the scope of the present work.

Recovery Potential of Existing Tailings. A complete plane table survey of the existing tailings piles was made in 1979, and the tailings were sampled by auger drilling. Recovery in agitated leach tests on pulverized portions of the auger drill samples showed 58 percent gold recovery from an average fire assayable gold content of 0.03 oz per ton. These tests essentially confirm work done by Battelle Memorial Institute in the 1950's.

The tailings piles contain a relatively small tonnage of material (150,000 tons), but they significantly improve the economics of heap leaching, since they can be used as the protective sand layer which is needed below the heaps.

SCOPE OF WORK PERFORMED

The conclusions summarized here are based on a total of 90 laboratory bucket leach tests on 40 different samples; four 40-foot column leach tests on 25-ton samples; one 1700 ton field leach test; 500 cyanide bottle roll tests; and 160 bottle roll and centrifuge tube leach tests on tailings samples. In procuring the samples, a total of five collapsed mine portals were re-opened, including the King Tunnel, which required excavation of a fifty foot deep cut and re-timbering of 300 feet of new entry. One-hundred-fifty feet of new drift was driven. A surface pit was excavated, totalling about 3000 tons (1700 tons were actually moved from the pit for testing), and a heap leach test was constructed on the ore from the pits and operated through two seasons.

Ore blasted and moved during the various underground sampling programs totalled about 800 tons, at 37 different locations.

RECOMMENDED FOR FURTHER WORK

Laboratory testing of ores for heap leach evaluation is essentially complete. Further work is not likely to change, or improve the accuracy of, the conclusions presented here. Recoveries from the only large-scale field heap leach test were below expectations (46 percent versus the projected 57 percent); this has been attributed to the coarse size of the uncrushed ore placed on the heaps, and non-ideal stacking procedures. At least one further large-scale heap leach test (2500 tons) is recommended to verify that modified procedures will result in predicted recoveries (70 percent from crushed ore).

SUMMARY OF METALLURGICAL RESULTS

Figures 1 and 2 present bar charts showing the various metallurgical test programs which have been carried out on the Gilt Edge ores. Figure 1 summarizes the results for the oxidized ores, and Figure 2 summarizes the results of the unoxidized ores and tailings.

Footnotes for the bar charts are presented below.

(1) Cyprus Research Laboratories conducted two column leach tests in 1978 on rotary drillhole cuttings.

(2) In October of 1978, a preliminary series of seven 50 to 200 pound samples were taken by hand methods; three of these were from the walls of the Dakota Maid Pit, four from walls of underground workings in the Sunday Zone. These were subject to bucket leach tests, and the results were highly variable. The results were reported in Appendix C to the report titled "Gilt Edge Field Sampling and Laborotary Tests, 1979 through 1980", dated 10 August, 1981.

(3) In the 1979 bulk sampling program, a total of 21 one-ton bulk samples were taken at various underground locations. Thirteen of these were Sunday Zone oxidized samples (three in the One John), five were Sunday Zone unoxidized samples, and three were Dakota Maid unoxidized samples taken from the Dakota Maid decline. Forty-two bucket leach tests were run. The sampling procedures and test results were presented in the same report mentioned in footnote (2). In a subsequent program, ten bucket leach tests were run on selected large rocks, 2 to 8-inches diameter, from the same bulk samples. These were reported in a dual report issued 10/23 November, 1981, titled "1979 Mini-Bulk Samples/1979 Bulk Samples - Selected Large Rocks".

(4) During 1979, samples were also taken from sites which were inaccessible to the mechanized mining equipment used for the one-ton samples. A total of twelve mini-bulk (200 pound) samples were taken at these sites using a hand-held hammer and moil. These consisted of five oxidized, and two unoxidized, samples taken from the R-3 level of the internal Rattlesnake shaft (approximately 60 feet above the present water table, at a depth of 250 feet below the present surface); three samples of oxidized ore from the extreme north end of the Dakota Maid Zone in adits "B" and "C", and one oxidized and one unoxidized sample from the Dakota Maid Pit. Results of these tests are presented in the report named in footnote (3).

(5) In 1980, the long-collapsed King Tunnel was re-opened by excavating a 50-foot deep cut through overburden, re-mining through the collapsed timbers until solid rock and open tunnel was reached, then re-timbering and backfilling the new portal. The old tunnel was still open and accessible for sampling beneath most of the Dakota Maid Pit area. Ten one-ton and one 25-ton bulk samples were taken at various locations in the tunnel. Of the one-ton samples, two of these were too low grade to warrant further testing. Four oxidized, and four unoxidized, samples were tested in a laboratory bucket leach test program. Two of the oxidized samples tested contained below 0.007 ounces gold per ton. The apparent results were similar to the higher grade samples, but they are not reported in Figure 1 because the grade is too low to permit meaningful recovery figures to be derived from the tests.

The 25-ton sample was a sample of highly pyritic unoxidized ore. This sample was the subject of a 40-foot field column test on a 25-ton sample, and two laboratory bucket leach tests. Figure 4 shows a plot of recovery versus time for the bucket and tall-column leach tests on this sample (identified as column 4).

(6) In 1980, five 15-ton samples were taken in the Sunday Zone, Rattlesnake Tunnel, at five of the sites which had been sampled the previous year with one-ton samples. The 15-ton samples were combined by color (two yellow, three red) to make two bulk samples, which were leached at run-of-mine size in 40-foot, 25 ton test columns. Additional bucket leach tests were also performed on the samples. The additional bucket leach tests, and the 40-foot columns, essentially duplicated the bucket test results of the previous year. Figure 3 shows a plot of recovery versus time for the bucket and tall-column leach tests on these ores.

(7) As part of the same 1980 bulk sampling program, a new tunnel, the Laron Adit, was driven into an oxidized portion of the Dakota Maid Zone, approximately 80 feet north of the north end of the Dakota Maid Pit. A 25-ton bulk sample was mined from the face of the tunnel and used for a 25-ton, 40-foot column test and two laboratory bucket leach tests. Figure 4 shows a plot of recovery versus time for the bucket and tall-column leach tests on this sample (identified as column 3).

Figure 5 presents a plot showing recovery versus time for several of the different types of tests conducted on a typical sample of Sunday Zone oxidized ore.

(8) In 1980, the south pit wall of the Sunday Zone Pit was drilled and blasted to break approximately 3000 tons of rock. Seventeen-hundred tons of this material was excavated from the pit, and stacked 12 feet high on a double-layer hypalon pad for a heap leach test. Six laboratory bucket leach tests, and an extensive sampling and assaying program, were run on the ore to determine laboratory recoveries and heap ore grade.

Field heap construction methods were presented in a pictorial report titled "Pictorial Summary, 1980 Gilt Edge Heap Leach Project", dated 7 March, 1981. Heap leach recovery in 130 days leaching, was 46 percent of contained gold, which was less than the projected 57 percent (based on expected recovery from uncrushed rocks). The lower recovery is attributed primarily to non-ideal stacking procedures. Head assays and recoveries from the test are discussed in a letter to Ron Graichen, dated 19 April, 1982.

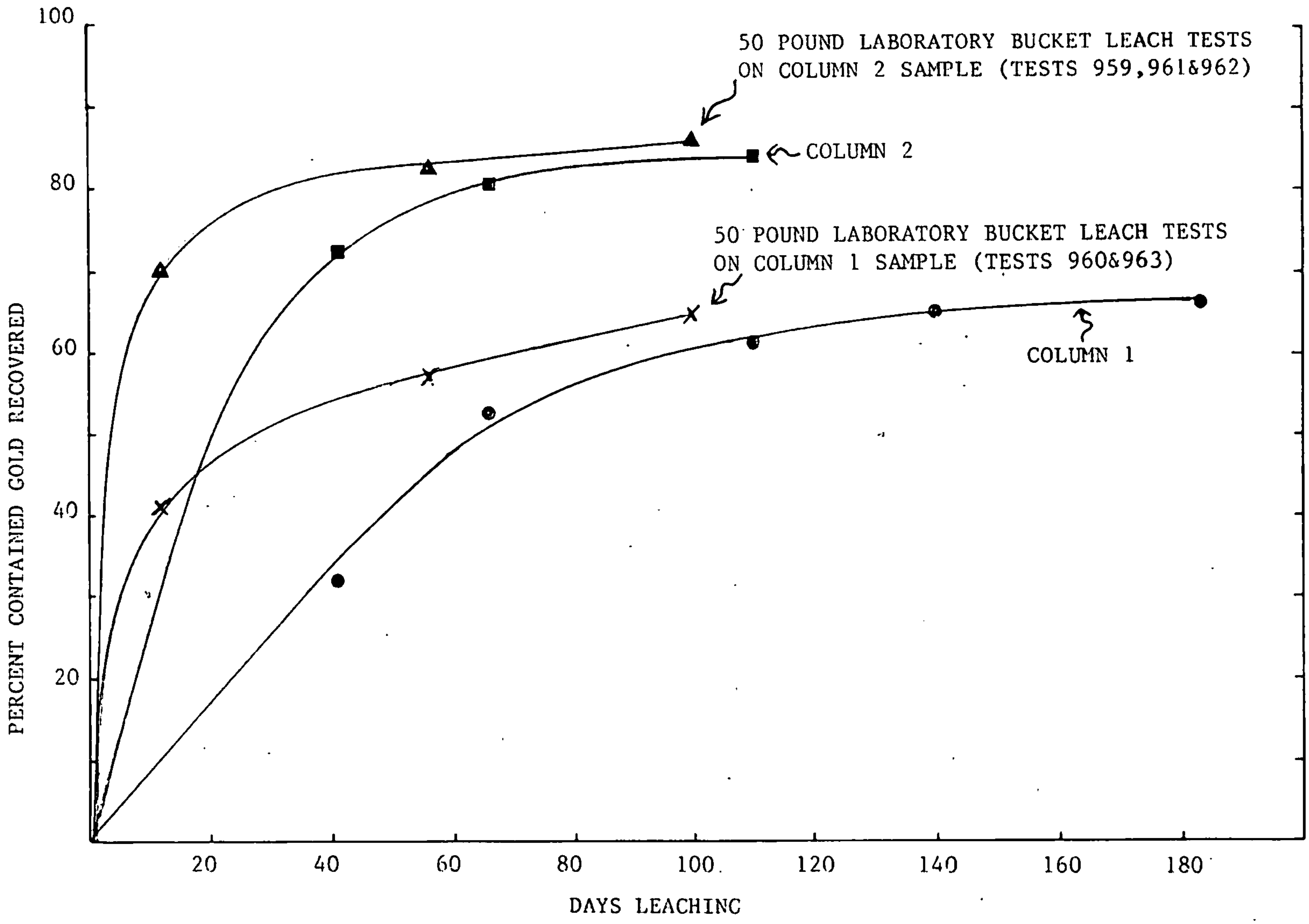

FIGURE 3. GOLD RECOVERY:GILT EDGE 40 FOOT COLUMN
TESTS ON UNCRUSHED ORES.
RATTLESNAKE TUNNEL SAMPLES:COLUMNS 1&2

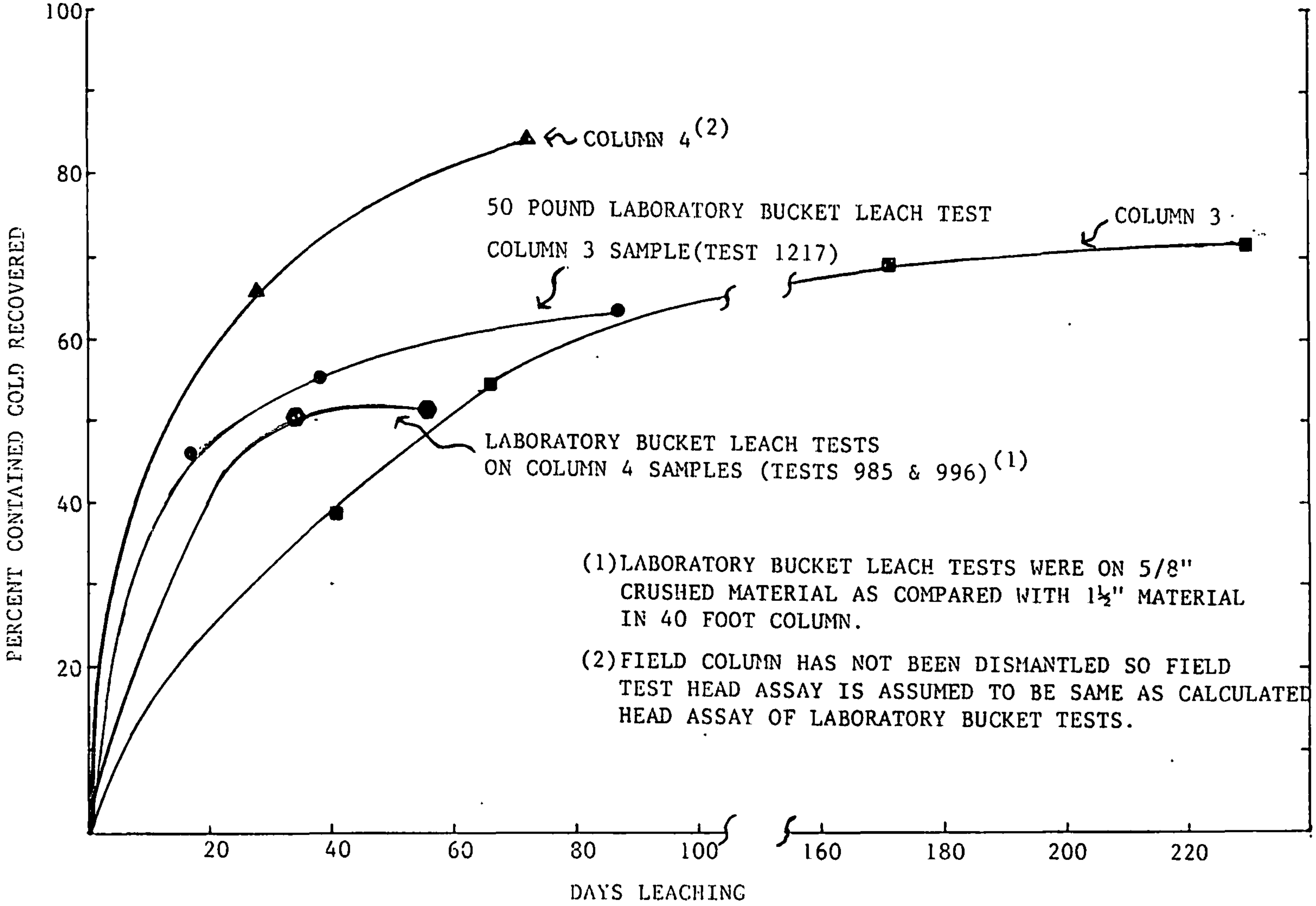

FIGURE 4. GOLD RECOVERY: GILT EDGE 40 COLUMN TESTS
UNCRUSHED DAKOTA MAID SAMPLE: COLUMN 3
CRUSHED KING TUNNEL SAMPLE: COLUMN 4

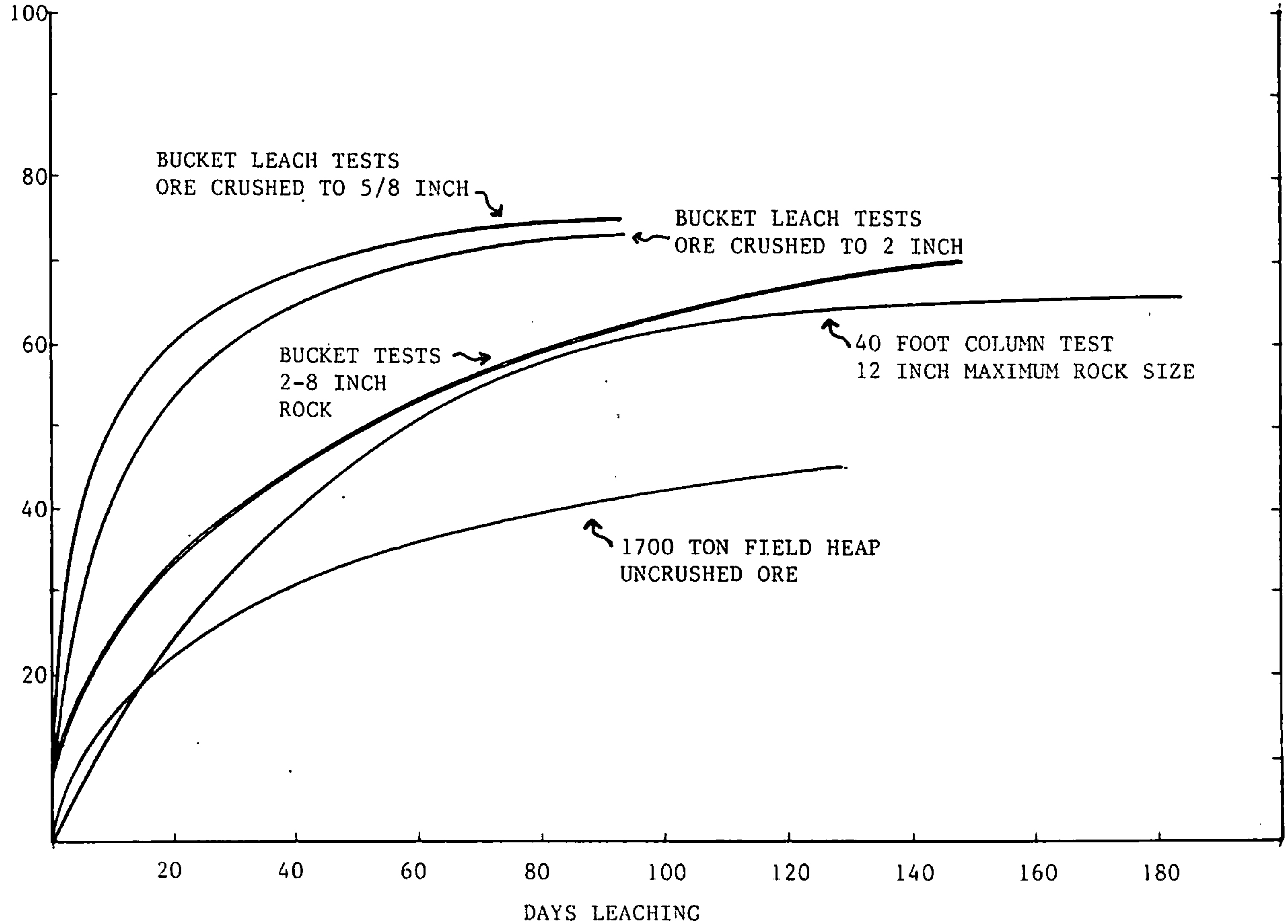

FIGURE 5. GILT EDGE OXIDIZED ORES
RATE OF GOLD RECOVERY
COMPARISON BETWEEN TEST TYPES & ORE SIZES

At the end of the 1980 leach program, an attempt was made to destroy residual cyanide in the heap using sodium hypochlorite. The attempt was only partially successful. During 1981, the heap was re-leached to yield an additional 7 percent recovery of contained gold in 30 days leaching, then another attempt was made to destroy residual cyanide, this time using hydrogen peroxide. The results of this attempt were largely successful. They were outlined in a letter to George Trabits dated 21 June, 1982, which was a proposal for further neutralization (if this was deemed necessary to meet conditions for abandonment of the heap).

The map pocket of this report contains two drawings showing the significant operating statistics for the heap leach test. One drawing graphically presents operating statistics such as cyanide usage, gold recovery, and chemical conditions for the heap operating days in 1980. The second presents data showing chemical consumption and solution assay data for the 1981 neutralization period.

(9) In late 1979, a plane table survey was made of the two existing tailings piles from the old mills. A soils engineering firm was contracted with to drill the tailings, using a large rotary auger drill of the type used for soils sampling. Where the drill rig could not gain access, the tailings were manually sampled. A total of 175 feet of drilling was completed, and 100 samples were taken. The samples were subjected to bottle roll and centrifuge tube tests on pulverized portions. Also, a composite portion of the samples from each auger hole was sent out to determine residual free and total cyanide content.

(10) Nearly all rotary drillhole intervals assaying more than 0.005 ounces gold per ton have been subject to bottle roll tests using pulverized samples. Approximately 40 percent of those same samples were tested for cyanide solubility from unpulverized material (approximately 100 percent minus 1/4-inch, which is the normal size that is created by the drill). The samples were also assayed for cyanide-soluble silver and copper. Results are presented in a report titled "Report 1982 B, Cyanide Solubility", dated 19 March, 1982.

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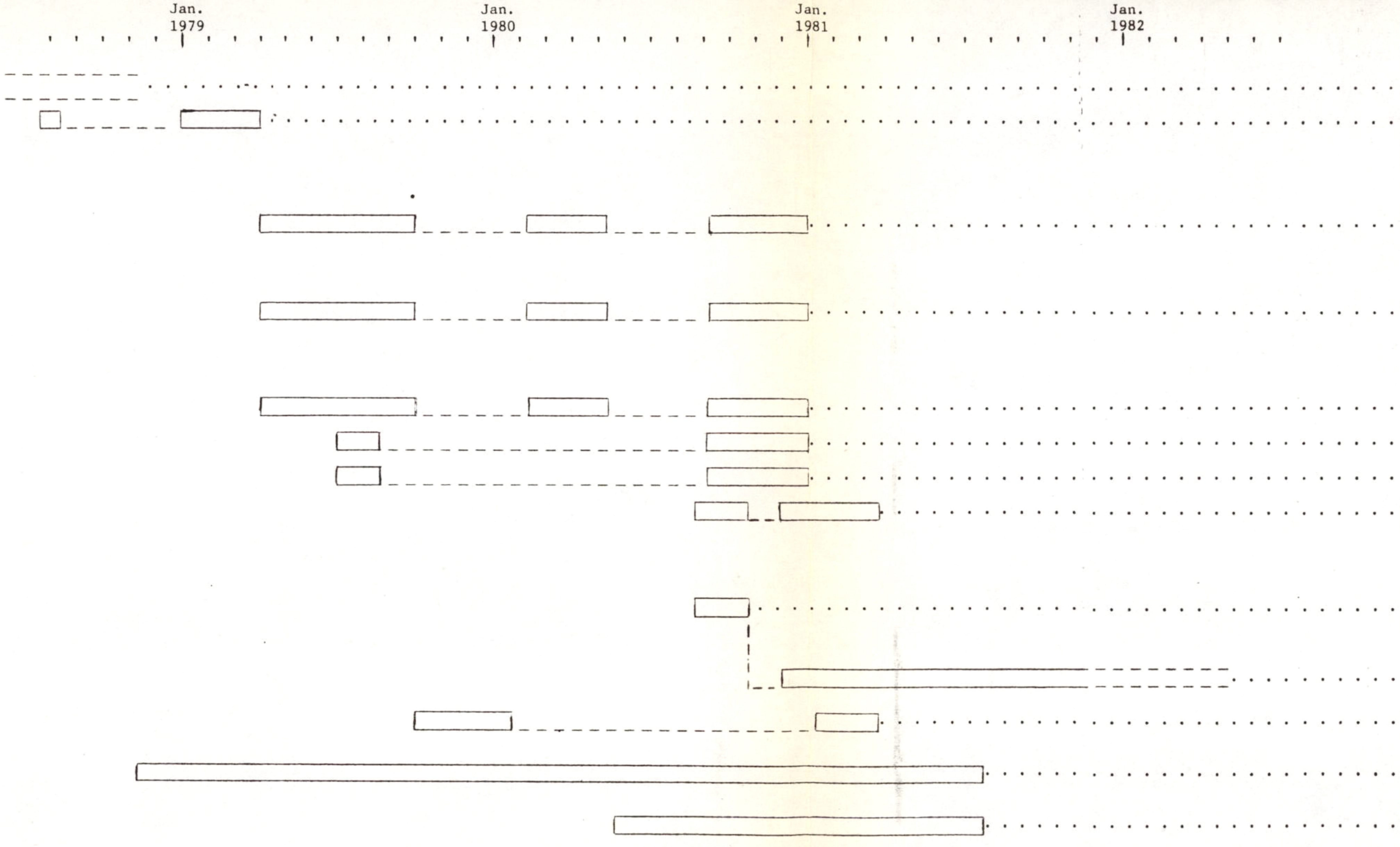
FIGURE 2. GILT EDGE, SOUTH DAKOTA

METALLURGICAL TESTING 1978-1981
HISTORY OF TESTS ON UNOXIDIZED ORES & TAILINGS & RDH CUTTINGS



	Percent Gold Recovery in Bucket Tests
Column Leach Tests on RDH cuttings, Cyprus Research Laboratory (1)	
Three 50 - lb Samples from exposed walls, Dakota Maid Pit(2)	one - 60 % * two - 30 % *
One 50 - lb Sample from Hoisthouse Level, highly pyritic ore,(2) 100 foot level Sunday Zone	20 % *
Five one-ton Samples from 100 feet below the surface, Sunday Zone(3)	
5 Bucket Leach Tests, crushed to 2-inches	63 %
5 Bucket Leach Tests, crushed to 5/8-inches	63 %
Two one-ton, High Pyrite Samples from 80 feet below surface, Dakota Maid Decline(3)	
2 Bucket Leach Tests, crushed to 2-inches	58 %
2 Bucket Leach Tests, crushed to 5/8-inches	58 %
One 1-ton Low-Pyrite Sample from 80 feet below surface, Dakota Maid Decline(3)	88 %
Two 200-pound Samples from 250 feet below surface, Sunday Zone(4)	62 %
Two 200-pound High Pyrite Samples from Stope Walls, Dakota Maid Pit(4)	47 % *
Five one-ton bulk samples from 80 feet below surface, King Tunnel,(5) Dakota Maid Zone	
5 Bucket Leach Tests, crushed to 2-inches	28 % *
10 Bucket Leach Tests, crushed to 5/8-inches	32 %
One 25-ton High Pyrite Sample from 80 feet below surface, King Tunnel,(6) Dakota Maid Zone	
2 Bucket Leach Tests, crushed to 5/8-inches	52 % *
1 40-foot Column Leach Test on 1-1/2 inch rocks (Recovery based on head assay of the bucket leach tests)	80 %
Agitated Leach Tests on Samples taken from 175 ft of auger drilling and (7) channel samplings in old mill tailings	
500 Bottle Roll Tests on Pulverized Portions, oxidized and unoxidized (10) rotary drillhole cuttings - average recovery 77%	
200 Bottle Roll Tests on Unpulverized (minus 1/4-inch) Portions, rotary (10) drillhole cuttings - average recovery 67%	
*Overall most probable recovery from unoxidized ores, based on average recovery from tests marked with asterik.	43%

(1) All footnotes to this chart are presented in the text of the report.

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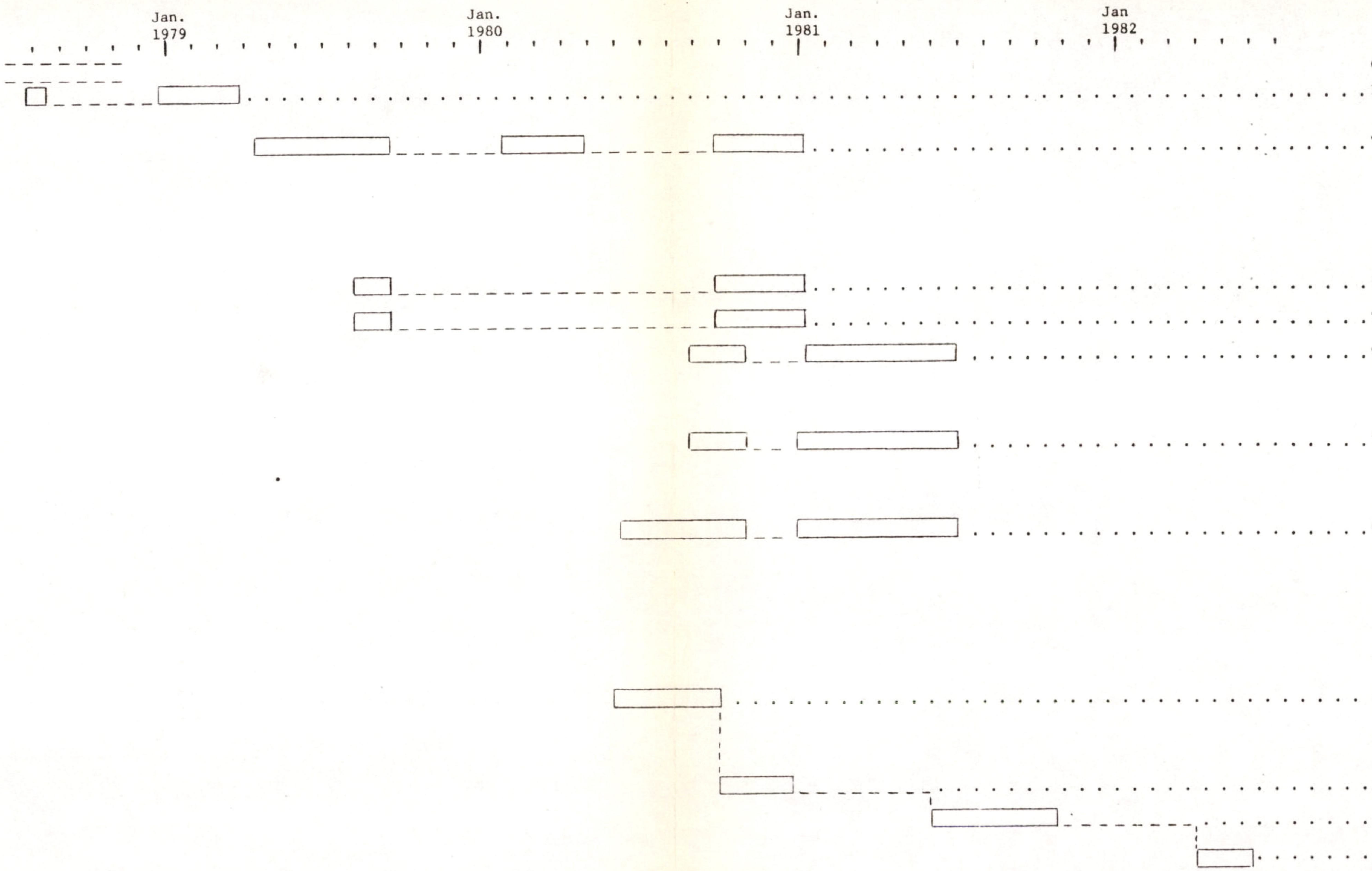
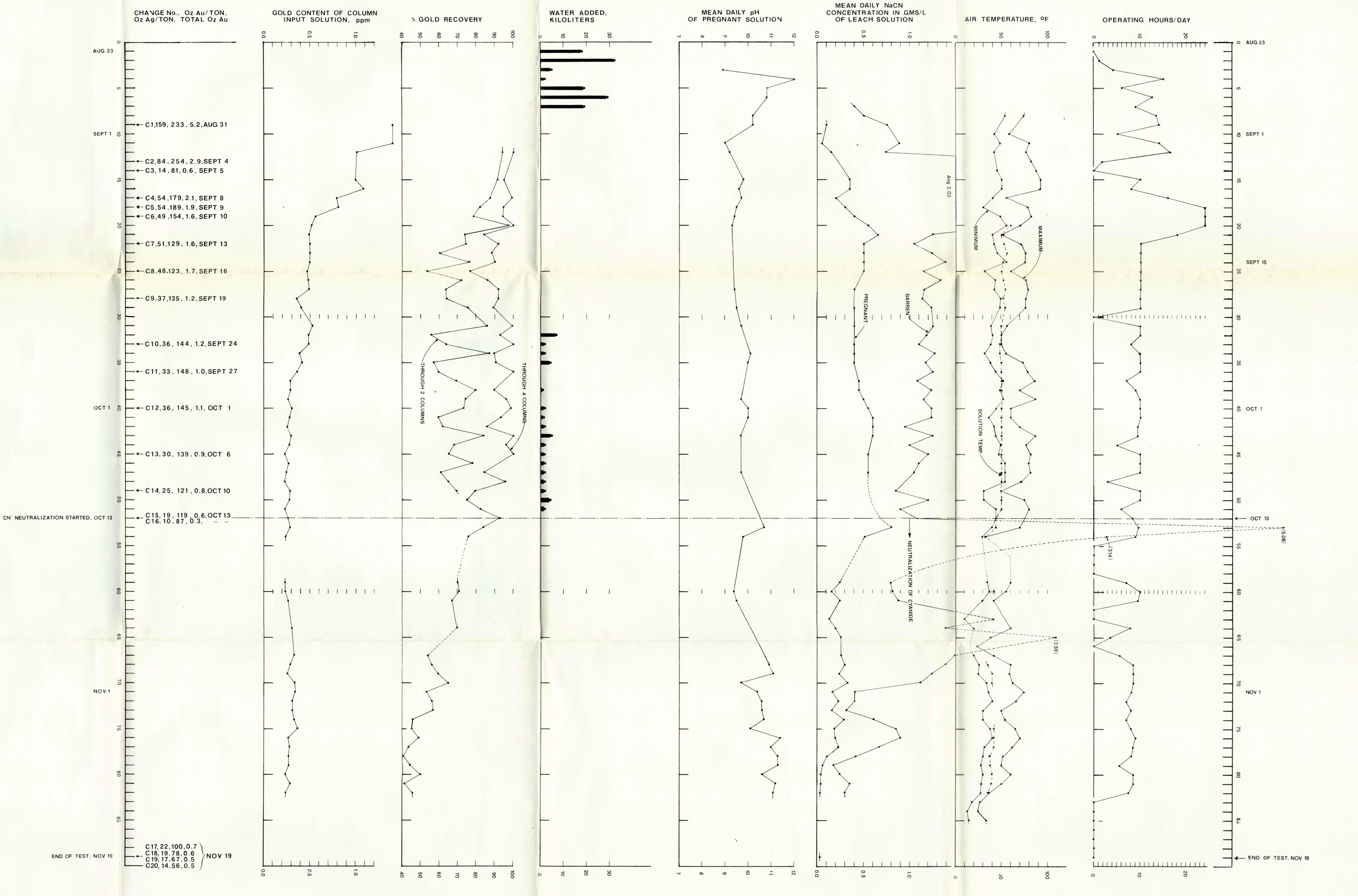
FIGURE 1. GILT EDGE, SOUTH DAKOTA

METALLURGICAL TESTING 1978 - 1981
HISTORY OF TESTS ON OXIDIZED ORES



		Percent Gold Recovery in Bucket Tests
Column Leach Tests on RDH cuttings, Cyprus Research Laboratory (1)		
Four Samples from old exposed walls, 5 Bucket Tests (2)		14 - 70 %
Thirteen one-ton Samples from 100 ft below surface, Sunday Zone (3)		
13 Bucket Leach Tests, crushed to 2-inches		72 % *
13 Bucket Leach Tests, crushed to 5/8-inches		72 %
10 Bucket Leach Tests, @ 2 - 8-inches	67 Day Recovery	55 %
	150 Day Recovery	72 % *
Five 200 Pound Samples from 250 ft below surface, Sunday Zone (4)		69 % *
Three 200 Pound Samples from Dakota Maid Zone and North End of Property (4)		65 % *
Two one-ton Samples from 80 ft below surface, King Tunnel, Dakota Maid Zone (5)		
2 Bucket Leach Tests, crushed to 2-inches		76 % *
2 Bucket Leach Tests, crushed to 5/8-inches		76 %
Two 25 -ton Samples taken for 40-ft Column Leach Tests, Sunday Zone (6)		
5 Bucket Leach Tests, crushed to 1-1/2 inches		76 %
2 40 ft Column Leach Tests on run-of-mine (12-inch rocks)		75 % *
One 25-ton Sample taken for 40 ft Column Leach Test, north Dakota Maid Zone (7)		
1 Bucket Leach Test, crushed to 2-inches	87 Day Recovery	63 %
	87 Day Recovery	67 %
1 Forty-foot Column Leach Test on run of mine (12-inch rocks)		
	87 Day Recovery	58 %
	230 Day Recovery	71 % *
1700 ton Sample taken for Heap Leach Test, Sunday Zone surface (8)		
4 Bucket Leach Tests, crushed to 1-1/2 inches		72 % *
1 1700 ton Field Leach Test on run-of-mine (24-inch rocks) 130 Day Recovery		47 %
Attempted Neutralization of heap with Sodium Hypochlorite		
Neutralization of heap with Hydrogen Peroxide, decrease of free NACN to 4.0 ppm		
Continuing monitoring of heap, further decrease of free NACN to 2.1 ppm		
*Overall Average Gold Recovery from oxidized ores, all tests marked with asterisk		72 %

(1) All footnotes to this chart are presented in the text of the report.



AMOCO MINERALS CORPORATION

GRAPHICAL PRESENTATION OF DATA RELATING TO THE

1980 HEAP LEACH TEST

OF THE

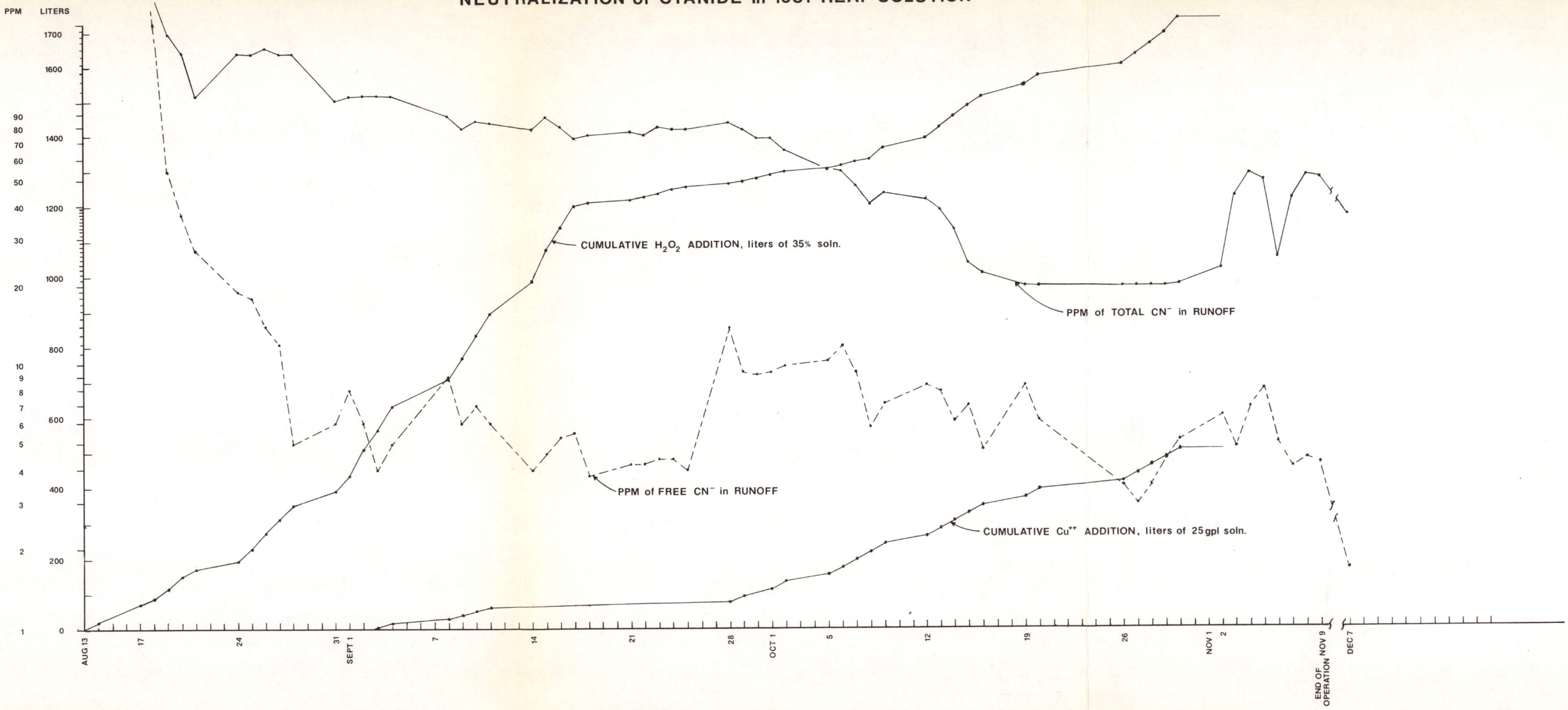
GILT EDGE PROJECT

LAWRENCE COUNTY, SOUTH DAKOTA

MILLER-KAPPES Co.
W.F PLYLEY

NOVEMBER, 1981

NEUTRALIZATION of CYANIDE in 1981 HEAP SOLUTION



CYANIDATION OF GILT EDGE ORE

by

CYPRUS METALLURGICAL PROCESSES CORPORATION

May 12, 1982

P-1000

This X-Copy for
Ron Graichen.

CYPRUS METALLURGICAL PROCESSES CORPORATION

TUCSON, ARIZONA

FILE NUMBER: 823-42-5001

SUBJECT: CYANIDATION OF GILT EDGE ORE

AUTHOR: Jerry E. Dobson

REPORT DATE: May 12, 1982

May 12, 1982

CYANIDATION OF GILT EDGE ORE

INTRODUCTION

Samples of gold ore from several diamond drill hole cores and composites of the Gilt Edge prospect were received for cyanidation testwork. The furnished samples ranged in gold content from 0.7 to 7.7 ppm gold and from 1.5 to 20 ppm silver content. The leaching tests were directed toward the treatment of agitated ore pulps although some flotation concentrates as well as roasted concentrates were leached. The latter effort resulted from a spate of erroneous assays which led us to conclude mistakenly that the gold value was quite refractory.

EXPERIMENTAL

Sample Preparations

The various ore samples were reduced from the as received condition to about -14 mesh using jaw and roller crushing. Samples of the crushed core specimens were split out for head assays, test samples and a reserve supply.

Further size reduction was carried out in a laboratory steel ball mill or in the instance of concentrates, which were small samples, by hand in a mortar and pestle.

Samples which were roasted were treated in an oven operating at between 600 and 625°C.

CYANIDATION OF GILT EDGE ORE

Analytical

The metal values in both ore residue and solution was monitored by atomic absorption spectroscopy. In the case of gold some difficulties arose which resulted in poor accountability and delayed production of believable extraction data. Some liquor samples, perhaps related to the sulfide content of the ores, seem to undergo a reductive loss of part of their gold content with time. Delays in assaying as short as one day may be serious in the matter of gold accountability under these circumstances.

LEACHING PROCEDURES

Cyanide leachings of ores and concentrates were carried out using the rolled bottle method of agitation. Using untreated ores, 200g samples were employed per test whereas flotation concentrates or roasted concentrate samples were leached on a 20g scale. All leachings were performed on 45% solids in aqueous NaCN slurry.

The concentrations of the metal values developed in the leaching solution were monitored as a function of time. Similarily the consumption of lime and sodium cyanide during the dissolution was measured. The test samples were leached a minimum of 24 hours and occasionally longer.

Records of quantities were kept entirely by weight necessitating only that a thorough washing of solid be achieved to have accuracies within the limits of the assay precision.

CYANIDATION OF GILT EDGE ORE

Flotation

Each ore sample was subjected to a rough flotation expected to recover its pyritic fractions. Samples were ground to an intermediate size in seven minutes of grinding, the pH adjusted to the range from 7.5 to 8.5 using Na_2CO_3 and brought to ca. 30% solids. A total dose of 0.1 lb/ton i-amylxanthate was added over a ten minute flotation time and MIBC was used as needed for froth. Head, concentrate, and tails assays indicated typical recoveries of about >80% of the gold content and 60% of silver.

RESULTS

Table I presents the referencing identification for the Amoco Minerals Company's sample designation and the letter identification assigned for convenience by Cymet. For quick reference the overall performance of the leaching of gold from each of the various samples under the several conditions employed in this study is also reported. The degree of grinding is designated by the series A thru E for each sample in order of increasing grind time. The split at 200 mesh was measured and is keyed at the bottom of the table. The quantity of gold developed in the cyanide leachate for these various conditions is reported in the fourth column in ounces per ton of ore leached and was based upon the quantity of gold detected in solutions after the cyanidation reaction. As to leaching efficiency, the calculated head derived from product assays was used to determine the percentage reported in the fifth column. Finally, the sixth column of Table 1 records the consumption of NaCN per ton of ore.

The remaining tables detail the individual leachings including not only the gold results but silver and copper extractions as well.

Table II sets out the cyanidation efficiencies which were found for several samples of Gilt Edge ore when cyanidation was tested on coarsely ground materials. Because of the sometimes difficulty in accountability, perhaps because of coarse gold, we report two extraction values in this numerical tabulation. The first is the extraction based upon the average gold content of the head samples; the second extraction column is based upon the level of gold found in that particular sample's leached products, i.e. a calculated head basis. The third column lists the mass balance across the leaching process from average head composition to leached tailings and liquor levels. Similarily, Columns 4, 5, and 6 report the corresponding results calculated for the silver content of the ore which, though generally low, were also monitored. Strong cyanide extraction, 0.2%, of the gold from these rather coarsely crushed samples established a base with which to compare other conditions. This was the most coarsely crushed of the samples measuring about 22% -200 mesh fraction. The recovery was inadequate, averaging only 51%.

A somewhat different format is employed in Tables III through VI and VIII to take advantage of a computer printout. It is self explanatory in large, but contains more information. The columns under the heading <u>Assays</u> give the head, leach liquor,

CYANIDATION OF GILT EDGE ORE

tails and calculated head values. Extractions are reported based both upon calculated head values, which are preferred, as well as head values which are included for the sake of confidence as well as a measure by which to gauge the balances.

Table III summarizes the leaching results for an intermediate grind of the ores. A typical screen analysis in this sample set yielded 45% - 200 mesh fraction. This resulted in a substantially better degree of leaching than was given by the coarsely ground samples in Table II. The extractions averaged 74% based upon calculated head values and 74% as a gold weighted average as well.

Table IV and V are the result of yet finer grinding at 65% and 70% -200 mesh respectively. This spacing is closer than planned but the data of both are included to increase the data base. The only difference, other than the marginal size distribution change, was that the NaCN level of Table V (70% -200 mesh) was reduced to 0.05% to verify the usual lack of effect of CN^- concentration upon leaching kinetics in the ranges being employed. As may be seen from the individual tests and the weighed averages presented in Table I the lowered cyanide level may have had some effect, but this is primarily due to depletion between samplings rather than a bona fide kinetic rate effect, i.e. the reaction time was truncated by reagent consumption. The extractions in Table IV and V calculated as a straight average were 79 and 71% respectively. Calculated weighted average based upon contained gold values were 83 and 74%.

CYANIDATION OF GILT EDGE ORE

Table VI furnishes the data of the cyanidation behavior of the most finely ground set of samples, corresponding to test E of the summary Table I. These leachings attempted to remove particle size from consideration as a limiting factor in dissolution. All were subjected to twenty minutes grinding in the steel mill and reported >98% as a -200 mesh fraction, in fact they were >95% -325 mesh. The background cyanide level was restored to 0.2% NaCN in order to handle any increase in copper and acid activity resulting from enhanced oxidation at this very fine state of subdivision. The average extraction was 76% as a straight average and 80% as a weighted average. This seems to be biased by two very poor performances by samples D and K in this experiment.

Table VII assembles the data concerning the small investigation of concentrating the ore. This is included for completeness, however, the reason for its existence was based upon some assay difficulties which, when resolved, faded along with the need of concentration. As mentioned earlier, no optimization of flotation recovery was attempted, merely a rougher concentration in order to attain sufficient concentrate for testing. Any assessment of concentration or concentration and roasting as possible processing steps would require additional evaluation. In this table we report the overview of the results obtained in concentrating and concentrate leaching the gold from each ore sample. A composite ore sample was also processed through each operation. The final entry in the table gives the weighed average gold extraction from the concentrates D thru L.

CYANIDATION OF GILT EDGE ORE

Table VIII provides the detailed test by test data from the leaching of the concentrates and the composite concentrate. Also included here is the leaching behavior of the composite concentrate after four hours roasting at 600°C which reduced the sulfur content from >30 to >2%. The format of this table parallels those given as III through VI.

The figure presented gives the extraction curve for gold as a function of the fineness of grind. The general feature is obvious and expected in the indication of higher extraction resulting from increasing particle subdivision. A principle feature would appear to be the rapid increase in leachability as the quantity of -200 mesh material increased from about 20% to 45%; further grinding did not dramatically affect recovery (see weighted average extraction for A thru E grinds in Table I). The latter two data points for grinds D and E may, however, as mentioned before, somewhat underestimate extraction. If so, the flattening of the curve should not be as promounced as portrayed in the Figure. The recoverable upper limit of gold from this ore may thus approach 90% under the conditions employed here.

May 12, 1982

SUMMARY

The cyanidation of Gilt Edge ore in an agitated leaching operation may be expected to yield about 75 to 80% of the gold content or 0.046 oz/ton on a weighted average basis. This assumes a grinding to about 70% -200 mesh; marginal increase in yield to the 85% range might be expected with the samples ground to 100% -200 mesh. The consumption of sodium cyanide, of course, increases with the fineness of grind reaching an average of 72 lb/oz Au in our most finely ground samples. Lime demand, on the other hand, showed only modest increases during the same experiments; about 100-110 lb/oz Au is required.

The brief examination of concentrates revealed that flotation may easily recover ca. 85% of the gold value and that upon cyanidation approximately 84% of this is recoverable. The net yield then is about 72% with the advantage of about 90% less bulk to be treated. The average grade of concentrate treated was 14.9 ppm Au yielding 0.37 oz Au/Ton of concentrate. Cyanide consumption was approximately the same as the unconcentrated ore at 30-40 lb/oz Au; lime usage decreased sharply to about 13 lb/oz Au.

The leaching of the roasted concentrate gave significantly greater recovery of 97% of the gold as expected since the occlusion of particles in the pyrite matrix is probably responsible for their inactivity.

Roasting in conjunction with flotation will recover about 82% of the gold value with reduced cyanide and grinding costs. These factors in addition to the size reduction of concentrate handling facilities may justify more thorough evaluation of the flotation recovery limits.

CYANIDATION OF GILT EDGE ORE

TABLE I

Sample Referencing and Overview of Results

Sample			Gold Recovery		Leaching Behavior
Cymet Letter	AMOCO Designation		OPT	%	NaCN Consumed #T
D	GLE Composite DDH#21 50'-444"	A			
		B	0.028	71	2.6
		C	0.028	71	2.8
		D	0.025	63	3.4
		E	0.018	43	4.5
E	GLE Composite DDH#22 450'-740'	A	0.059	61	2.0
		B	0.053	79	0.4
		C	0.064	85	0.4
		D	0.068	77	0.6
		E	0.060	91	3.3
F	GLE Composite DDH#22 80'-180' & 320'-450'	A	0.014	41	0.5
		B	0.021	55	0.8
		C	0.025	68	1.2
		D	0.021	55	3.0
		E	0.028	71	4.6
G	81 DDH-6 610'-680' Sample "A"	A	0.122	57	0.6
		B	0.132	76	0
		C	0.160	90	0.3
		D	0.146	82	0.4
		C	0.160	96	2.5
H	81 DDH-6 680'-775' Sample "B"	A	0.029	46	0.3
		B	0.046	76	2.4
		C	0.043	83	0.3
		D	0.046	73	1.6
		E	0.053	95	1.8
I	81 DDH-16 100'-200' Sample "A"	A			
		B	0.021	88	1.7
		C	0.021	88	1.9
		D	0.021	88	1.0
		E	0.021	88	1.8

CYANIDATION OF GILT EDGE ORE

TABLE I (con't)

Sample Referencing and Overview of Results

Sample: Cymet Letter	Sample: AMOCO Designation		Gold Recovery OPT	Gold Recovery %	Leaching Behavior: NaCN Consumed #T
J	81 DDH-16	A			
	240'-295'	B	0.032	85	1.5
	Sample "A"	C	0.046	89	0.3
		D	0.036	86	1.8
		E	0.036	92	2.6
K	81 DDH-17	A			
	9' - 196'	B	0.021	71	3.3
		C	0.021	71	2.6
		D	0.014	49	3.6
		E	0.007	26	4.6
L	81 DDH-17	A			
	196'391'	B	0.025	68	1.1
	Sample "A"	C	0.025	68	1.2
		D	0.036	71	1.1
		E	0.028	83	3.4
D thru L - Weighted Average of all Samples		A	0.054	51%*	Only D,E,F&G
		B	0.042	74%	
		C	0.048	83%	
		D	0.046	74%	
		E	0.044	80%	

Grind
- A 22% -200 mesh
- B 45% -200 mesh
- C 65% -200 mesh
- D 70% -200 mesh
- E 98% -200 mesh

TABLE II

(Gilt Edge Ore Cyanidation)

Sample	% Au Ext H	-CH	% Bal	% Ag Ext H	-CH	% Bal	#/T NaCN	#/T CaO
E	60	61	98	58	21	282	2	8
F	32	41	78	54	56	96	0.5	8
G	54	56	96	35	35	100	0.6	6.7
H	45	46	98	16	16	101	0.3	6.7

Fire Assay Au

E	100	71	141
F	55	39	72
G	73	70	104
H	56	72	77

Typical screen analysis: 36.1%-65; 22.2%-200

NaCN: 0.2%
Time: 24 hours
H: Based on head assay
CH: Based on calculated head assay.

40 TO 50%-200 mesh,0.2% NaCN,5#/T CaO,24 hrs.

TABLE III

Test ID	*	Assays ppm As	ppm Au	ppm Cu	% Extraction As	Au	Cu	% Balance As	Au	Cu	Reagent consumptio #/T CN	#/T CaO
D	H	3.6	1.6	295.	58.	61.	64.	99.	86.	113.		
	L	1.7	0.8	154.								
	T	1.5	0.4	146.								
	C	3.6	1.4	334.	58.	71.	56.				2.6	4.9
	OPT				0.060	0.028	0.38@					
E	H	2.1	3.4	114.	46.	54.	30.	118.	69.	98.		
	L	0.8	1.5	28.								
	T	1.5	0.5	78.								
	C	2.5	2.3	112.	39.	79.	30.				0.4	4.7
	OPT				0.028	0.053	0.07@					
F	H	6.0	1.5	233.	53.	49.	57.	498.	89.	102.		
	L	2.6	0.6	109.								
	T	26.7	0.6	104.								
	C	29.9	1.3	237.	11.	55.	56.				0.8	4.5
	OPT				0.093	0.021	0.27@					
G	H	6.1	7.7	183.	34.	59.	11.	509.	77.	112.		
	L	1.7	3.7	16.								
	T	29.0	1.4	186.								
	C	31.1	5.9	206.	7.	76.	9.				-0.0	4.6
	OPT				0.060	0.132	0.04@					
H	H	5.9	2.1	298.	17.	76.	9.	95.	99.	116.		
	L	0.8	1.3	22.								
	T	4.6	0.5	318.								
	C	5.6	2.1	345.	18.	76.	8.				2.4	4.8
	OPT				0.028	0.046	0.05@					
I	H	1.5	1.0	49.	49.	73.	25.	155.	83.	147.		
	L	0.6	0.6	10.								
	T	1.6	0.1	60.								
	C	2.3	0.8	72.	31.	88.	17.				1.7	4.9
	OPT				0.021	0.021	0.02@					

* H=head L=liquor T=tail C=calculated head OPT=tr.oz./Ton
@=lbs./Ton

40 TO 50%-200 mesh,0.2% NaCN;5#/T CaO;24 hrs.

Test ID	*	Assays PPM As	PPM Au	PPM Cu	% Extraction As	Au	Cu	% Balance As	Au	Cu	Reagent consumption #/T CN	#/T CaO
J	H	2.7	1.6	132.	63.	69.	9.	137.	81.	81.		
	L	1.4	0.9	11.								
	T	2.0	0.2	109.								
	C	3.7	1.3	122.	46.	85.	11.				1.5	4.9
	OPT				0.050	0.032	0.03@					
K	H	19.9	1.4	736.	61.	52.	63.	98.	81.	108.		
	L	9.9	0.6	383.								
	T	7.4	0.4	329.								
	C	19.5	1.1	796.	62.	65.	59.				3.3	4.9
	OPT				0.352	0.021	0.93@					
L	H	4.6	1.6	255.	48.	53.	68.	2863.	78.	105.		
	L	1.8	0.7	142.								
	T	129.5	0.4	94.								
	C	131.7	1.3	267.	2.	68.	65.				1.1	4.7
	OPT				0.064	0.025	0.35@					

* H=head L=liquor T=tail C=calculated head OPT=tr.oz./Ton
@=lbs./Ton

approx.65%-200 mesh,0.2% NaCN,5#/T CaO,24 hrs.

TABLE IV

Test ID	*	Assays ppm As	Assays ppm Au	Assays ppm Cu	% Extraction As	% Extraction Au	% Extraction Cu	% Balance As	% Balance Au	% Balance Cu	Reagent consumption #/T CN	Reagent consumption #/T CaO
D	H	3.6	1.6	295.	61.	61.	67.	83.	86.	101.		
	L	1.8	0.8	163.								
	T	0.8	0.4	99.								
	C	3.0	1.4	298.	73.	71.	67.				2.8	5.0
	OPT				0.064	0.028	0.40@					
E	H	2.1	3.4	114.	46.	65.	45.	85.	76.	127.		
	L	0.9	1.8	42.								
	T	0.8	0.4	93.								
	C	1.8	2.6	144.	55.	85.	36.				0.4	4.7
	OPT				0.028	0.064	0.10@					
F	H	6.0	1.5	233.	53.	57.	64.	81.	84.	108.		
	L	2.6	0.7	123.								
	T	1.7	0.4	102.								
	C	4.9	1.3	252.	65.	68.	60.				1.2	4.7
	OPT				0.093	0.025	0.30@					
G	H	6.1	7.7	183.	36.	71.	23.	88.	79.	113.		
	L	1.8	4.5	35.								
	T	3.2	0.6	165.								
	C	5.4	6.1	208.	41.	90.	21.				0.3	4.7
	OPT				0.064	0.160	0.09@					
H	H	5.9	2.1	298.	21.	70.	8.	129.	84.	107.		
	L	1.0	1.2	20.								
	T	6.4	0.3	295.								
	C	7.6	1.8	319.	16.	83.	8.				0.3	4.5
	OPT				0.036	0.043	0.05@					
I	H	1.5	1.0	49.	73.	73.	32.	153.	83.	171.		
	L	0.9	0.6	13.								
	T	1.2	0.1	68.								
	C	2.3	0.8	84.	48.	88.	19.				1.9	4.9
	OPT				0.032	0.021	0.03@					

* H=head L=liquor T=tail C=calculated head OPT=tr.oz./Ton
@=lbs./Ton

approx.65%-200 mesh,0.2% NaCN,5#/T CaO,24 hrs.

		Assays			% Extraction			% Balance			Reagent consumptio	
Test ID	*	ppm As	ppm Au	ppm Cu	As	Au	Cu	As	Au	Cu	#/T CN	#/T CaO
J	H	2.7	1.6	152.	68.	99.	10.	90.	112.	82.		
	L	1.5	1.3	12.								
	T	0.6	0.2	110.								
	C	2.4	1.8	125.	75.	89.	12.				0.3	4.9
	OPT				0.053	0.046	0.03@					
K	H	19.9	1.4	736.	68.	52.	69.	115.	74.	111.		
	L	11.1	0.6	413.								
	T	9.3	0.3	309.								
	C	22.8	1.0	819.	59.	71.	62.				2.6	4.8
	OPT				0.395	0.021	1.02@					
L	H	4.6	1.6	255.	56.	53.	70.	110.	78.	101.		
	L	2.1	0.7	147.								
	T	2.5	0.4	78.								
	C	5.1	1.3	257.	51.	68.	70.				1.2	4.7
	OPT				0.075	0.025	0.36@					

* H=head L=liquor T=tail C=calculated head OPT=tr.oz./Ton
@=lbs./Ton

Approx. 70% -200 mesh, 0.05% NaCN, 24 hrs.

TABLE V

Test ID	*	Assays ppm As	ppm Au	ppm Cu	% Extraction As	Au	Cu	% Balance As	Au	Cu	Reagent consumpti[illegible] #/T NaCN	#/[illegible] Ca[illegible]
D	H	3.6	1.6	295.	64.	54.	60.	128.	86.	97.		
	L	1.9	0.7	146.								
	T	2.3	0.5	109.								
	C	4.6	1.4	287.	50.	63.	62.				3.4	5.[illegible]
	OPT				0.068	0.025	0.36@					
E	H	2.1	3.4	114.	64.	68.	41.	187.	89.	113.		
	L	1.1	1.9	38.								
	T	2.6	0.7	83.								
	C	3.9	3.0	129.	34.	77.	36.				0.6	5.[illegible]
	OPT				0.039	0.068	0.09@					
F	H	6.0	1.5	233.	59.	48.	69.	98.	87.	97.		
	L	2.9	0.6	131.								
	T	2.3	0.6	66.								
	C	5.8	1.3	226.	61.	55.	71.				3.0	5.[illegible]
	OPT				0.103	0.021	0.32@					
G	H	6.1	7.7	183.	42.	65.	13.	102.	79.	102.		
	L	2.1	4.1	19.								
	T	3.7	1.1	163.								
	C	6.3	6.1	186.	41.	82.	12.				0.4	5.[illegible]
	OPT				0.075	0.146	0.05@					
H	H	5.9	2.1	298.	23.	76.	16.	96.	104.	102.		
	L	1.1	1.3	40.								
	T	4.3	0.6	254.								
	C	5.6	2.2	303.	24.	73.	16.				1.6	6.[illegible]
	OPT				0.039	0.046	0.10@					
I	H	1.5	1.0	49.	75.	76.	17.	137.	87.	124.		
	L	0.9	0.6	7.								
	T	0.9	0.1	52.								
	C	2.0	0.8	61.	55.	88.	14.				1.0	6.[illegible]
	OPT				0.033	0.021	0.02@					

* H=head L=liquor T=tail C=calculated head OPT=tr.oz./Ton @=lbs./Ton

Approx. 70% -200 mesh, 0.05% NaCN, 24 hrs.

Test ID	*	Assays ppm As	Assays ppm Au	Assays ppm Cu	% Extraction As	% Extraction Au	% Extraction Cu	% Balance As	% Balance Au	% Balance Cu	Reagent consumpti $/T CN	$/T Ca(
J	H	2.7	1.6	152.	72.	76.	14.	112.	88.	84.		
	L	1.6	1.0	18.								
	T	1.1	0.2	105.								
	C	3.1	1.4	127.	64.	86.	17.				1.8	6.
	OPT				0.057	0.036	0.04@					
K	H	19.9	1.4	736.	75.	36.	70.	108.	73.	104.		
	L	12.3	0.4	422.								
	T	6.4	0.5	254.								
	C	21.4	1.0	769.	70.	49.	67.				3.6	5.
	OPT				0.438	0.014	1.03@					
L	H	4.6	1.6	255.	67.	75.	69.	111.	106.	104.		
	L	2.5	1.0	144.								
	T	2.0	0.5	89.								
	C	5.1	1.7	265.	60.	71.	66.				1.1	5.
	OPT				0.089	0.036	0.35@					

* H=head L=liquor T=tail C=calculated head OPT=tr.oz./Ton
@=lbs./Ton

Approx. 96% -325 mesh, .2% NaCN, 24 hrs.

TABLE VI

Test ID	*	Assays ppm As	ppm Au	ppm Cu	% Extraction As	Au	Cu	% Balance As	Au	Cu	Reagent consumptio #/T CN	#/T CaO
D	H	3.6	1.6	295.	47.	39.	71.	100.	90.	117.		
	L	1.4	0.5	172.								
	T	1.9	0.8	136.								
	C	3.6	1.4	346.	47.	43.	61.				4.5	4.9
	OPT				0.030	0.018	0.42@					
E	H	2.1	3.4	114.	64.	61.	19.	116.	67.	127.		
	L	1.1	1.7	18.								
	T	1.1	0.2	123.								
	C	2.4	2.3	145.	55.	91.	15.				3.3	5.4
	OPT				0.039	0.060	0.04@					
F	H	6.0	1.5	233.	39.	64.	87.	88.	90.	115.		
	L	1.9	0.8	167.								
	T	2.9	0.4	64.								
	C	5.2	1.4	268.	44.	71.	76.				4.6	5.5
	OPT				0.068	0.028	0.41@					
G	H	6.1	7.7	183.	42.	71.	26.	101.	74.	110.		
	L	2.1	4.5	39.								
	T	3.6	0.2	153.								
	C	6.2	5.7	201.	42.	96.	24.				2.5	5.9
	OPT				0.075	0.160	0.10@					
H	H	5.9	2.1	298.	21.	87.	16.	100.	92.	104.		
	L	1.0	1.5	40.								
	T	4.7	0.1	261.								
	C	5.9	1.9	310.	21.	95.	16.				1.8	5.9
	OPT				0.036	0.053	0.10@					
I	H	1.5	1.0	42.	92.	76.	52.	112.	87.	205.		
	L	1.1	0.6	21.								
	T	0.3	0.1	75.								
	C	1.6	0.8	101.	82.	88.	25.				1.8	4.8
	OPT				0.039	0.021	0.05@					

* H=head L=liquor T=tail C=calculated head OPT=tr.oz./Ton

@=lbs./Ton

Approx. 96% -325 mesh, .2% NaCN, 24 hrs.

		Assays			% Extraction			% Balance			Reagent consumption	
Test ID	*	ppm As	ppm Au	ppm Cu	As	Au	Cu	As	Au	Cu	$/T CN	$/T CaO
J	H	2.7	1.6	152.	94.	76.	31.	131.	82.	109.		
	L	2.1	1.0	38.								
	T	1.0	0.1	120.								
	C	3.6	1.3	166.	72.	92.	28.				2.6	4.8
	OPT				0.075	0.036	0.090@					
K	H	19.9	1.4	736.	10.	18.	55.	98.	70.	100.		
	L	1.6	0.2	331.								
	T	17.6	0.7	330.								
	C	19.6	0.9	734.	10.	26.	55.				4.6	4.9
	OPT				0.057	0.007	0.810@					
L	H	4.6	1.6	255.	72.	60.	80.	107.	72.	107.		
	L	2.7	0.8	168.								
	T	1.6	0.2	67.								
	C	4.9	1.2	272.	67.	83.	75.				3.4	4.9
	OPT				0.096	0.028	0.410@					

* H=head L=liquor T=tail C=calculated head OPT=tr.oz./Ton
@=lbs./Ton

CYANIDATION OF GILT EDGE ORE

TABLE VII

Flotation

Sample	Float Recovery (%) Au	Float Recovery (%) Ag	Grade (ppm) Au	Grade (ppm) Ag	Leachability (%) Au	Leachability (%) Ag	#/TNaCN
D	77	79	9.0	22.1	73	55	11.1
E	82	87	18.8	22.5	84	52	10.8
F	88	71	7.5	20.6	68	59	11.0
G	79	86	55.3	43.8	88	39	10.5
H	95	72	21.8	51.9	81	69	10.7
I	45	-	8.0	18.3	95	79	12.3
J	51	39	13.3	17.9	97	84	11.8
K	75	57	5.5	61.8	58	48	11.6
L	79	36	7.5	18.6	73	63	11.2
Gold Weighted Average D thru L					84	59	11.2
Composite Conc.	85	70	15.8	30.3	83	59	11.0
Roasted Compo Conc			19.9	35.4	97	23	4.7

GLE concs., 0.45% NaCN, 5#/T CaO, 24 hrs.

TABLE VIII

Test ID	*	Assays ppm As	ppm Au	ppm Cu	% Extraction As	Au	Cu	% Balance As	Au	Cu	Reagent consumptio #/T CN	#/T CaO
D	H	22.1	9.0	1334.	44.	68.	74.	79.	93.	93.		
	L	7.9	5.0	809.								
	T	7.8	2.3	250.								
	C	17.4	8.4	1237.	55.	73.	80.				11.1	4.9
	OPT				0.281	0.178	1.97@					
E	H	22.5	18.8	735.	31.	83.	42.	61.	98.	109.		
	L	5.8	12.8	251.								
	T	6.6	2.9	496.								
	C	13.7	18.5	802.	52.	84.	38.				10.8	4.9
	OPT				0.206	0.455	0.61@					
F	H	20.6	7.1	904.	64.	67.	70.	108.	98.	104.		
	L	10.8	3.9	521.								
	T	9.1	2.2	309.								
	C	22.3	7.0	945.	59.	68.	67.				11.0	4.9
	OPT				0.384	0.139	1.27@					
G	H	43.8	49.1	1862.	38.	78.	9.	99.	88.	106.		
	L	13.7	31.5	134.								
	T	26.5	5.0	1816.								
	C	43.2	43.4	1979.	39.	88.	8.				10.5	4.9
	OPT				0.487	1.121	0.33@					
H	H	51.9	21.8	3914.	194.	86.	5.	282.	106.	98.		
	L	82.5	15.3	148.								
	T	45.9	4.4	3661.								
	C	146.6	23.1	3842.	69.	81.	5.				10.7	4.9
	OPT				2.936	0.544	0.36@					
I	H	18.3	8.0	356.	23.	89.	44.	29.	94.	339.		
	L	3.4	5.8	129.								
	T	1.1	0.4	1049.								
	C	5.3	7.5	1207.	79.	95.	13.				12.3	6.1
	OPT				0.121	0.207	0.32@					

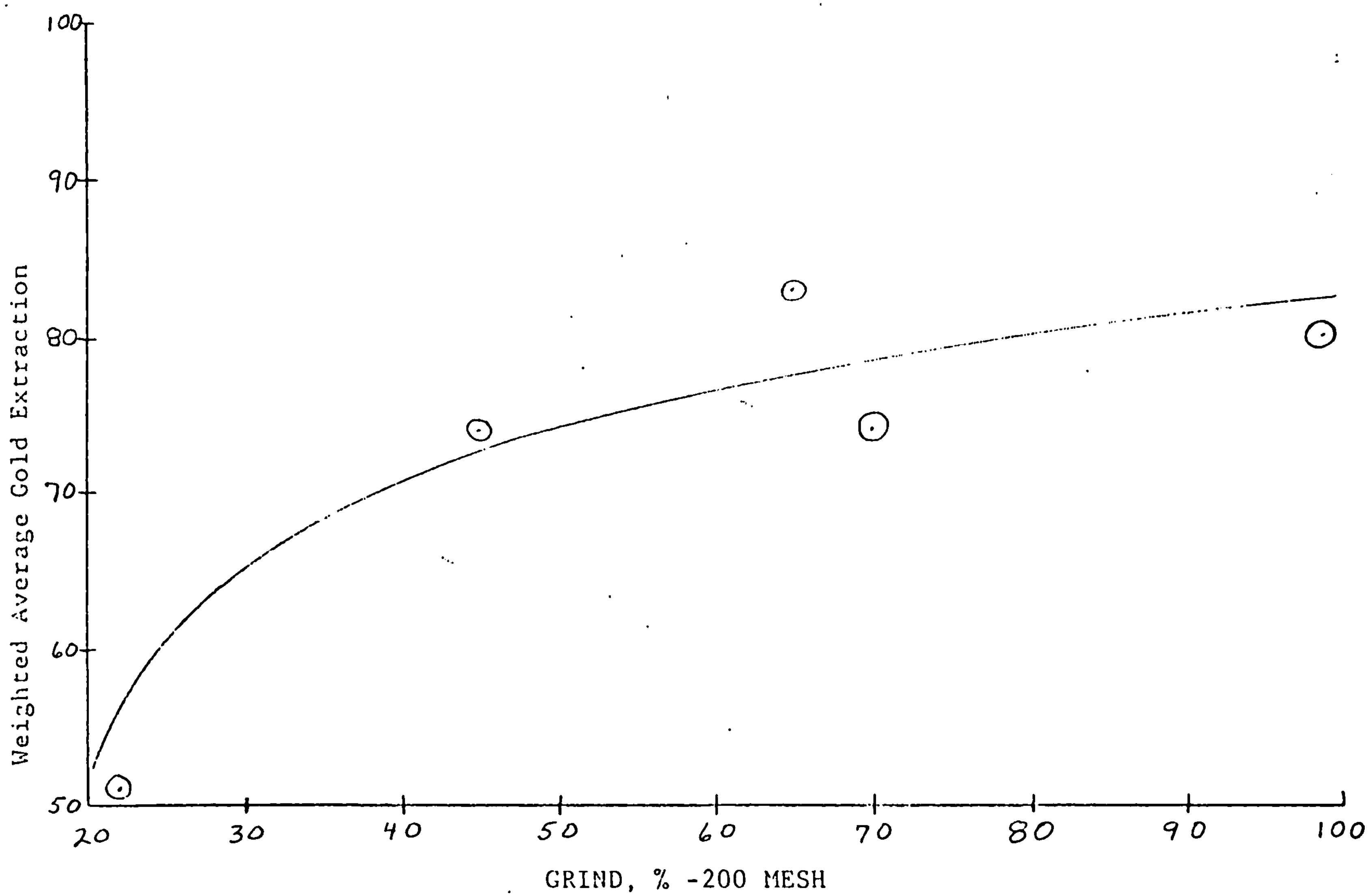
* H=head L=liquor T=tail C=calculated head OPT=tr.oz./Ton
@=lbs./Ton

GLE concs., 0.45% NaCN, 5#/T CaO, 24 hrs.

		Assays			% Extraction			% Balance			Reagent consumption	
Test ID	*	ppm Ag	ppm Au	ppm Cu	Ag	Au	Cu	Ag	Au	Cu	#/T CN	#/T CaO
J	H	17.9	13.3	407.	51.	103.	35.	60.	106.	227.		
	L	7.4	11.2	115.								
	T	1.7	0.4	784.								
	C	10.7	14.1	924.	84.	97.	15.				11.8	5.9
	OPT				0.264	0.399	0.28@					
K	H	61.8	5.5	2423.	54.	51.	80.	113.	67.	97.		
	L	27.3	2.3	1584.								
	T	36.6	2.0	419.								
	C	69.9	4.8	2351.	48.	58.	82.				11.6	4.9
	OPT				0.971	0.082	3.86@					
L	H	18.6	7.5	1362.	65.	73.	83.	103.	100.	98.		
	L	9.9	4.5	930.								
	T	7.0	2.0	203.								
	C	19.1	7.5	1338.	63.	73.	85.				11.2	4.9
	OPT				0.352	0.160	2.27@					
Cmp	H	30.3	15.1	1646.	60.	69.	51.	102.	83.	89.		
	L	14.9	8.6	686.								
	T	12.7	2.1	626.								
	C	30.9	12.6	1463.	59.	83.	57.				11.0	4.9
	OPT				0.530	0.306	1.67@					

* H=head L=liquor T=tail C=calculated head OPT=tr.oz./Ton
@=lbs./Ton

FIGURE: GOLD EXTRACTION VS GRIND



CYANIDE SOLUBILITY
GOLD FROM CRUSHED AND PULVERIZED ORES IN AGITATED TESTS AND SILVER AND COPPER IN AGITATED AND BUCKET LEACH TESTS

by

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GILT EDGE, SOUTH DAKOTA

REPORT 1982 B

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AND
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INTRODUCTION

During the period 1979-1981, approximately 500 rotary drillhole cuttings from Gilt Edge were tested in Reno for cyanide soluble gold, silver and copper. The samples tested included nearly all intervals above 0.02 ounces gold per ton, and several intervals below this level.

For approximately 300 of the samples only pulverized portions were tested. Approximately 200 of the samples were tested both pulverized and unpulverized.

The goals of these tests were as follows:

1. To measure the ability to use gold solubility from agitated tests on small laboratory samples, as a method of guiding mine operations for production heap leaches.

2. To identify areas of the orebody in which the leach behavior of the ore varies significantly from the norm, and to measure cyanide consumption in agitated leach tests.

3. To determine the relationship between silver as reported in fire assays, cyanide soluble silver in agitated tests, and cyanide soluble silver in bucket leach tests, as a guide to designing the recovery processes.

4. To compare the solubility of copper in agitated tests on pulverized samples, and in bucket leach tests on coarse-crushed samples. This data also provides a guide for design of conventional milling operations, and a comparison of recoveries and solution chemistry between the mill and the heap leach.

5. To determine distribution of cyanide soluble copper, as a geologic and metallurgical guide to zones of secondary copper enrichment.

This report is primarily a presentation of the laboratory results, which are listed in Appendices A and B. The report itself, briefly presents some conclusions which can be drawn from the data as they apply to each of the goals listed above. A final section outlines the test procedures used.

1. AGITATED TESTS AS A PRODUCTION GUIDE

A previous report, titled "Gilt Edge Field Sampling and Laboratory Tests - 1979 - May 1980", and dated 10 August, 1981, included a list of the gold recoveries in agitated tests on 479 samples. The list is not reproduced here, although the gold solubilities from that list are presented in Appendix A. Figure 1 of this report summarizes the results.

Level of Gold Recovery. The tests indicate that the gold recovery from pulverized samples averages 76 percent of the fire assayable gold. There is a distinct difference between the Dakota Maid Zone (70 percent of the fire assay values) and the Sunday Zone (82 percent).

Number of Samples Required. Approximately 200 of the rotary drillhole cuttings, selected from the sample population exceeding 0.02 ounces gold per ton, were tested twice, once using 100 grams pulverized material and once using 100 grams unpulverized drillhole cuttings (mostly minus 1/4-inch). Gold recoveries from these tests are listed in Appendix B of this report. Figure 2 presents a summary of the results, differentiated between the Dakota Maid and Sunday Zone orebodies. Tailings of all tests were fire assayed so recovery results could be based on actual gold content. The average gold content based on calculated head assays, was essentially the same for both pulverized and unpulverized samples.

FIGURE 1. GILT EDGE: GOLD RECOVERY FROM AGITATED LEACH TESTS

24 HOUR TESTS ON PULVERIZED ROTARY DRILLHOLE CUTTINGS

	DAKOTA MAID ZONE			SUNDAY ZONE		
INTERVAL FEET	NO. SAMPLES TESTED	CYANIDE SOLUBLE Au oz/ton	CALC. HEAD Au oz/ton	NO. SAMPLES TESTED	CYANIDE SOLUBLE Au oz/ton	CALC. HEAD Au oz/ton
0 - 50	65	.051	.0565	53	.0286	.0350
50 - 100	57	.038	.0589	54	.0586	.0669
100 - 150	43	.030	.0480	43	.0509	.0599
Below 150	86	.026	.0439	78	.0491	.0631
TOTAL/AVERAGE	251	.0359	.513	228	.0469	.0569

OVERALL AVERAGES

Cyanide Soluble Au oz/ton	=	.0411
Calculated Head Au oz/ton	=	.0539
Average Recovery	=	76.25%

FIGURE 2. GILT EDGE: GOLD RECOVERY FROM AGITATED CYANIDE LEACH TESTS

COMPARISON OF PULVERIZED VERSUS UNPULVERIZED SAMPLES

ROTARY DRILLHOLE CUTTINGS

	DAKOTA MAID ZONE		SUNDAY ZONE	
	PULVERIZED	UNPULVERIZED	PULVERIZED	UNPULVERIZED
NUMBER SAMPLES TESTED	105	105	102	102
AVERAGE Au RECOVERED, oz/ton	.0349	.0308	.0539	.0441
AVERAGE FIRE ASSAY HEAD, Au oz/ton	.0472	.0472	.0622	.0622
AVERAGE CALC. HEAD, Au oz/ton	.0528	.0539	.0630	.0581
PERCENT CYANIDE SOLUBLE, Au. Based on Calc. Head Assay	66.10	57.14	85.56	75.90

OVERALL AVERAGES (Both Zones)

	PULVERIZED	UNPULVERIZED
Average oz/ton Au Recovered	.0443	.0374
Average Fire Assay Head	.0546	.0546
Average Calc. Head	.0578	.0560
Percent Au Recovered, Based on Calc. Head	76.64	66.79

Gold recovery from pulverized samples averaged 10 percent higher than gold recovery from unpulverized (below 1/4-inch) portions of the same samples.

Statistical analysis has been run on this data using a "t" test, which indicates that the calculated head grade of the samples can be predicted 90 percent of the time within 5 percent of actual, using about 22 samples in the Dakota Maid Zone, and about 32 samples in the Sunday Zone. Surprisingly, there did not seem to be much statistical difference in required sample size when using coarse-crushed, as compared with pulverized material (the pulverized material was usually made by pulverizing 400 grams of coarse-crushed material).

The use of 30 samples to predict gold recoveries in a specific ore block does not seem to be too prohibitive a number. The statistical analysis does not predict anything about the number of samples required to get a valid sample of the ore block, however. It merely shows that if 30 samples are analyzed, a good prediction of the overall sample gold content is obtained. This eliminates the need to fire assay each sample.

Typically, during production, a standard ore block of 3000 tons (perhaps one days production) would be drilled on 9 foot centers for blasting. Sampling and assaying all blastholes on 5 foot vertical intervals would yield 90 samples for the block. This level of sampling is higher than normal practice, but would not be prohibitively costly. We cannot, at present, predict whether or not this level of sampling is sufficient, but we feel a system for bottle roll cyanide soluble gold analyses can be developed for use in mine grade control.

Direct Use of Unpulverized Samples. The data in Figure 2 also presents a measure of overall gold recovery in the agitated tests on unpulverized, versus pulverized, samples. The unpulverized samples yield about 10 percent lower recovery than the pulverized samples. In the Sunday Zone, recovery from the unpulverized samples was about 76 percent, (as compared with 86 percent for this set of samples from pulverized material, and 81 percent for all Sunday Zone drillholes from pulverized material, as presented in Figure 1). The data indicates that bottle roll tests on unpulverized samples will yield an overall cyanide soluble gold content for the Sunday Zone, approximately 71 percent of the fire assayable gold content. Since this is the same percent recovery expected from the heap leach, such testing procedures should make fairly good operational guides for ore control purposes.

The use of unpulverized drillhole cuttings in agitated bottle roll tests presents several operational advantages for the field production laboratory:

1. Much larger sample sizes can be used in the bottles.

2. The samples do not have to be thoroughly dried (a few percent moisture prevents pulverizing, but can be factored into test results).

3. Because of the larger sample size, and direct testing of cuttings as they arrive at the lab from the field drills, the agitated bottle roll leach tests can be set up quickly and very productively. One operator can easily run 100 determinations for cyanide soluble gold per day.

2. VARIATION IN LEACH BEHAVIOR THROUGHOUT THE OREBODY

A set of orebody cross-sections, showing percent gold recoveries in agitated tests, was included in the appendices to the 10 August, 1981 report mentioned earlier. As those maps indicate, there do not appear to be any zones defineable laterally in cross-sections, where gold recoveries are significantly higher or lower than the norm.

Figure 3 of this report breaks down gold, silver and copper recoveries by ore depth and within each ore zone. There appears to be a recognizable pattern of behavioral differences within the Dakota Maid Zone, on this basis. (Note that the data is organized with depth in the hole, rather than by fixed elevation; organizing data on the latter basis has not yet been tried.)

Dakota Maid Zone. The Dakota Maid Zone contains approximately three times as much soluble silver and copper, on an ounce per ounce basis with soluble gold, as does the Sunday Zone. Data was also generated on cyanide consumption which averaged 6.42 pounds NaCN per ton in the Dakota Maid tests, and 4.35 pounds NaCN per ton in the Sunday tests.

Gold solubility with depth decreases uniformly and significantly in the Dakota Maid Zone, while cyanide consumption steadily increases. This, and the silver and copper results, are consistent with the geologic evidence that the Dakota Maid Zone contains an oxidized, copper-depleted cap above a "base" of high-sulfide ore.

Sunday Zone. There does not appear to be any significant variation with depth, in ore gold recovery within the Sunday Zone. In underground drifts in the Sunday Zone, there is evidence of secondary chalcocite and copper salts starting 100 - 200 feet below the surface. This "enrichment zone" is reflected by increasing soluble copper and cyanide consumption in the tests. These findings are consistent with the geologic evidence, which indicates a central vertical "core", or partially brecciated mass of oxidized, low sulfur, volcanics.

The general conclusion is, that there is not any area of the deposit which can be singled out for special treatment as a "refractory" ore block. For milling purposes, and probably even more markedly for heap leach purposes, the upper portions of the Dakota Maid Zone appear to show much better cyanide leach response than the lower portions.

FIGURE 3. GILT EDGE 24 HOUR AGITATED

CYANIDE LEACH TESTS
ON PULVERIZED RDH SAMPLES

Results Summarized by Vertical Depth in Ore Zones

DAKOTA MAID ZONE

INTERVAL Feet	NO. SAMPLES TESTED	CYANIDE SOLUBLE Au oz/ton	CYANIDE SOLUBLE Ag oz/ton	CYANIDE SOLUBLE Cu,ppm	NaCN CONSUMPTION lbs NaCN/ ton of ore	CALC.HEAD Au oz/ton	Au, % RECOVER Based on CALC.HEAD Assay
0 - 50	65	.051	.213	36	5.62	.0565	90.3
50 - 100	57	.038	.154	145	6.67	.0589	64.5
100 - 150	43	.030	.149	91	6.77	.0480	62.5
Below 150	86	.026	.137	78	6.69	.0439	59.2
AVERAGE	251	.0359	.163	85	6.42	.0513	70.0

SUNDAY ZONE

INTERVAL Feet	NO. SAMPLES TESTED	CYANIDE SOLUBLE Au oz/ton	CYANIDE SOLUBLE Ag oz/ton	CYANIDE SOLUBLE Cu, ppm	NaCN CONSUMPTION lbs NaCN/ ton of ore	CALC.HEAD Au oz/ton	Au,% RECOVERY Based on CALC.HEAD Assay
0 - 50	53	.0286	.051	15	3.45	.0350	81.7
50 - 100	54	.0586	.063	32	3.75	.0669	87.6
100 - 150	43	.0509	.078	25	4.52	.0599	85.0
Below 150	78	.0491	.091	58	5.29	.0631	86.3
AVERAGE	228	.0469	.073	36	4.35	.0569	82.4

For economic evaluation purposes, it would be useful to have data on the ore tonnages and projected grades, within each of the same vertical intervals shown in Figure 1.

It is also important to note that the recovery data presented in Figure 3 shows 24 hour cyanide soluble gold, from pulverized samples in a solution containing an excess of cyanide. Those recoveries are a good indication of potential recoveries in a conventional agitated cyanide mill. Mill recoveries might be improved somewhat by extremely fine grinding, and by additional oxidation or pre-oxidation, but the recoveries projected from Figure 3 are not far from the mid-70 percent recoveries actually achieved in the Dakota Maid mill of the 1930's. Heap leach recoveries are expected to be lower, 70 percent of fire assayable gold in the Sunday Zone and perhaps 50 percent in the Dakota Maid Zone.

3. SILVER CONTENT AND RECOVERY

Average silver content as reported by fire assay for the 479 samples used for pulverized tests was 0.14 ounces Ag per ton, and cyanide soluble silver in the same samples was 0.12 ounces Ag per ton. Gold recovery from the same tests was 0.041 ounces Au per ton, so the fineness of recovered gold bullion (ratio of gold to gold plus silver, times 1000) averaged 255 from the agitated leach tests. This should be a fairly good indication of the silver to gold recovery ratio that could be expected from conventional milling.

Figure 4 presents data on 18 one-ton bulk samples taken in 1979. The fineness of cyanide soluble metal in agitated tests on pulverized head samples is shown, as well as the fineness results from bucket leach tests on crushed (2-inches and 5/8-inches) rocks.

In the bucket leach test, 0.27 ounces silver were recovered for each ounce of gold recovered. In the bottle roll tests, 0.87 ounces of silver were recovered for each ounce of gold. After applying an adjustment for the difference in gold recovery (76 percent agitated, 71 percent bucket leach), the amount of silver recovered (i.e., ounces per ton of ore) in the bottle roll tests is 3.5 times the amount of silver recovered from the heap leach.

FIGURE 4. 1979 GILT EDGE BULK SAMPLES
SILVER AND COPPER SOLUBILITY
IN AGITATED TESTS AND HEAP LEACH TESTS

BULK SAMPLE NUMBER	FINENESS HEAD FIRE ASSAY (Au/Au+Agx1000)	AGITATED CYANIDE LEACH ON PULVERIZED SAMPLES		BUCKET TEST NOS.	BUCKET LEACH TESTS ON COARSE ROCKS		
		FINENESS RECOVERED METAL	CYANIDE SOLUBLE COPPER, ppm		FINENESS RECOVERED METAL	oz Au/ton RECOVERED	CYANIDE SOLUBLE COPPER, ppm
1	105	621	66	500-501	945	.049	8
2	434	634	57	502-503	944	.015	1
3	95	784	53	504-505	976	.008	6
4	978	810	80	506-507	678	.052	12
5	145	366	56	508-509	697	.009	2
6	37	711	60	510-511	864	.004	8
7	31	421	25	512-513	799	.007	5
8	186	297	28	514-515	746	.017	7
9	183	632	28	516-517	899	.031	8
10	99	543	40	518-519	863	.011	6
11	107	575	35	520-521	899	.016	6
12	64	462	38	522-523	764	.029	11
13	84	368	48	524-525	191	.002	29
14	193	586	39	526-527	895	.031	8
16	104	207	33	530-531	608	.001	6
17	91	425	59	532-533	790	.011	3
18	41	574	36	534-535	765	.020	5
20	738	602	92	538-539	901	.076	66
AVERAGE	206	534	48		790	.022	11

As already mentioned, for the orebody as a whole, the gold fineness in 479 tests on pulverized agitated samples, was 255. Assuming that the orebody averages 0.05 ounces gold per ton, the amount of silver recoverable from the orebody will be 0.095 ounces per ton in an agitated leach system (conventional mill). Applying the ratio of 3.5:1 for the amount of silver recoverable from the heap leach as compared with the mill, the amount of silver recoverable from the heap leach will be 0.027 ounces per ton. This represents a "charge" against heap leaching of 0.068 ounces Ag per ton, which is within the normal "noise" levels of economic projections.

As shown in Figure 3, there appears to be no major areas of the orebody which contain silver exceeding the average levels sufficient to require special treatment.

4. COPPER CONTENT AND RECOVERY

Cyanide soluble copper content of the 479 rotary drillhole samples, in agitated cyanide leach tests on pulverized material, is shown in Figure 3, and averages 85 ppm in the Dakota Maid Zone and 36 ppm in the Sunday Zone. The average for the two ore zones is equivalent to a copper solubility of 43 mg of copper per mg of gold. This is the ratio that could be expected in a conventional agitated cyanide mill.

Figure 4 presents cyanide soluble copper levels for 19 samples, which were tested in agitated tests and in 12 week long bucket leach tests. The data indicates that the copper that is leached in a heap will be 23 percent of the copper that is leached in a conventional mill. For the tests, this amounted to 14 mg per mg of gold, and for the orebody as a whole, it should amount to 10 mg per mg of gold.

Each milligram of copper will require use of an additional 2 to 5 mg of NaCN (depending on copper mineralogy). Assuming an average of 3:1, a gold recovery level of 0.035 ounces per ton, and a cyanide cost of $0.70 per pound, the cyanide cost due to dissolved copper in a convnetional milling situation will be $0.23 per ton.

Some specific areas of both ore zones contain visible chalcocite (cyanide soluble copper sulfide), and oxidized copper salts, and the cyanide soluble copper in some agitated tests exceeded 1000 ppm in solution. These local areas will require special consideration in either a mill or a heap leach, but they are not expected to affect overall economics or operations design.

5. ZONES OF SECONDARY COPPER ENRICHMENT

Visual evidence on both the Dakota Maid and the Sunday Zones, in underground workings, indicates that there could be significant areas of secondary copper enrichment. The location of these zones is important, both as a guide to expected behavior during processing, and as another bit of information to use in geologic evaluation of the orebody.

Data on cyanide soluble copper is presented in Figure 3, by depth within each ore zone. Appendix C (attached to the ten "primary" copies of this report), contains vertical cross-section maps through the orebody, and presents soluble copper in the rotary drillhole intervals, color-coded as to solubility levels (the solubility data is included in Appendix A). The maps do not present a clear picture of any identifiable pattern in copper solubility, either vertically or laterally.

The data in Figure 3 indicates a strong area of secondary enrichment in the Dakota Maid Zone at a depth of 50 to 100 feet, which is apparently also the contact zone between the oxidized cap and the pyrite-rich "base". Corresponding to the copper enrichment, gold recovery decreases and cyanide consumption increases. There does not appear to be an increase in overall gold or silver content.

In the Sunday Zone, copper solubility is fairly uniform, with a significant increase only at the deepest interval tabulated (below 150 feet). This corresponds with evidence underground. Copper staining is uncommon in the Rattlesnake Tunnel level (depth 0 to 130 feet), but chalcocite and copper staining can be seen heavily on the R 3 level (150 feet below the Rattlesnake, and 60 feet above the present water table).

TEST PROCEDURES FOR AGITATED TESTS

The bottle roll test procedure used for the Gilt Edge rotary drillhole cuttings was considerably more involved than a "conventional" cold cyanide leach test used to survey leach behavior on such ores as those from Northumberland, Nevada. In the conventional test, a small portion of ore (10 grams) is leached, the solution centrifuged and assayed, and the recoveries are calculated based on a head assay of the same ore pulp. Because of the presence of coarse gold in Gilt Edge ores, classical bottle roll test procedure was employed. A large portion of the ore (100 grams) was used, and at the end of the test, the tailings were filtered, washed, dried and fire assayed. The tailings fire assay results, rather than head fire assay values, were used in calculating per cent recoveries.

The test procedure was as follows:

1. A 100 gram portion of ore was placed in a 250 ml polybottle, 150 mls of water added and the pH adjusted to 10, if necessary, with lime.

2. NaCN was then added to the solution to give the equivalent of 5 grams per liter NaCN and the sample was placed on a set of rolls and rotated slowly for 24 hours.

3. After 24 hours, the solutions were filtered and checked by AA methods, for gold, silver and copper. Cyanide was measured by titration, and pH was measured using a pH meter.

4. The tailings were dried, pulverized if necessary, and submitted for fire assay.

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DWK/df

24-Hr Bottle Roll Tests on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Ag oz/ton	Cu, ppm
75-GLE-1	2 - 10	75-GLE-2201	825 A	0.056	0.48	45
-1	25 - 30	-2204	825 B	0.102	0.24	84
-1	40 - 50	-2206	826 B	0.032	0.00	96
-1	50 - 60	-2207	824 B	0.030	0.15	72
-1	60 - 70	-2208	957 A	0.071	0.32	863
-1	70 - 80	-2209	844 A	0.020	0.02	1734
-1	80 - 90	-2210				
-1	90 -100	-2211	824 C	0.033	0.10	72
-1	100 -110	-2212	826 C	0.018	0.00	99
-1	110 -120	-2213				
-1	120 -130	-2214	841 A	0.121	0.07	223
-1	130 -140	-2215	825 C	0.014	0.00	81
-1	140 -150	-2216	494 F	0.023	0.06	51
75-GLE-2	2 - 10	-2222	839 A	0.239	0.19	14
-2	10 - 20	-2223				
-2	20 - 30	-2224	815 G	0.042	0.23	84
-2	30 - 40	-2225	844 B	0.033	0.03	357
-2	50 - 60	-2227				
-2	60 - 70	-2228	838 A	0.076	0.07	715
-2	70 - 80	-2229	824 D	0.057	0.12	66
75-GLE-3	2 - 10	-2242	551 A	0.031	0.11	5
-3	10 - 20	-2243	839 B	0.047	0.08	10
-3	20 - 30	-2244	551 B	0.030	0.08	9
-3	40 - 50	-2246	494 G	0.008	0.04	8
-3	50 - 60	-2247	836 A	0.039	0.08	7
-3	60 - 70	-2248	837 A	0.011	0.06	5

24-Hr Bottle Roll Tests
on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Ag oz/ton	Cu, ppm
75-GLE-3	90 - 100	75-GLE-2251	824 E	0.033	0.19	72
-3	110 - 120	-2253	827 B	0.040	0.08	114
-3	140 - 150	-2256				
-3	150 - 160	-2257				
-3	160 - 170	-2258	836 B	0.006	0.00	283
-3	170 - 180	-2259	838 B	0.028	0.24	548
-3	180 - 190	-2260	841 B	0.121	0.23	433
-3	190 - 200	-2261	836 C	0.017	0.24	586
75-GLE-4	2 - 10	-2267	838 C	0.250	0.60	14
-4	10 - 20	-2268	836 D	0.070	0.54	7
-4	20 - 30	-2269	820 B	0.047	0.51	9
-4	40 - 50	-2271	841 C	0.289	1.18	398
-4	50 - 60	-2272	838 E	0.025	1.37	300
-4	60 - 70	-2273	481 D	0.011	0.31	78
-4	70 - 80	-2274	475 E	0.014	0.12	39
-4	80 - 90	-2275	844 C	0.026	0.11	840
-4	30 - 40	-2270	838 D	0.030	1.39	17
75-GLE-5	50 - 60	-2298	839 C	0.011	0.43	15
75-GLE-6	2 - 10	-2318	815 H	0.024	0.31	15
-6	10 - 20	-2319	836 E	0.164	0.48	11
-6	20 - 30	-2320	819 I	0.077	0.31	9
-6	30 - 40	-2321	819 F	0.059	0.48	16
-6	40 - 50	-2322	551 C	0.069	1.30	24
-6	50 - 60	-2323	838 F	0.032	0.04	2507

24-Hr Bottle Roll Tests
on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Ag oz/ton	Cu, ppm
75-GLE-7	120 - 130	75-GLE-2351				
-7	130 - 140	-2352				
-7	140 - 150	-2353	836 F	0.035	0.18	17
-7	150 - 160	-2354				
-7	160 - 170	-2355	839 D	0.044	0.29	86
-7	170 - 180	-2356	550 A	0.015	0.18	54
75-GLE-8	270 - 280	-2391	475 F	0.017	1.13	39
75-GLE-10	20 - 30	-2420				
-10	140 - 150	-2432	822 C	0.015	0.08	57
-10	150 - 160	-2433	837 B	0.007	0.10	79
-10	160 - 170	-2434	810 A	0.028	0.00	72
-10	170 - 180	-2435	809 A	0.018	0.14	54
75-GLE-11	60 - 70	-2443	550 B	0.020	0.11	51
-11	70 - 80	-2444	551 D	0.018	0.13	24
-11	90 - 100	-2446	552 A	0.047	0.31	60
-11	100 - 110	-2447	550 D	0.007	0.00	22
-11	110 - 120	-2448	551 E	0.019	0.16	39
-11	150 - 160	-2452	475 G	0.016	1.13	39
75-GLE-12	140 - 150	-2471	463 B	0.035	0.28	39
-12	180 - 190	-2475	481 F	0.014	0.00	75
-12	190 - 200	-2476	475 H	0.014	1.09	36

24-Hr Bottle Roll Tests
on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Cyanide Soluble Ag oz/ton	Cyanide Soluble Cu, p
75-GLE-13	25 - 30	75-GLE-2477	825 D	0.053	0.07	11
-13	30 - 40	-2478	462 A	0.021	0.24	37
-13	40 - 50	-2479	481 G	0.004	0.06	4
-13	140 - 150	-2489	547 B	0.007	0.04	51
-13	150 - 160	-2490	815 I	0.051	0.08	72
-13	160 - 170	-2491	476 A	0.026	0.07	37
-13	170 - 180	-2492	550 E	0.019	0.04	55
-13	180 - 190	-2493	815 J	0.022	0.04	72
-13	190 - 200	-2494	481 H	0.008	0.07	75
75-GLE-14	2 - 10	-2495	844 D	0.018	0.07	4
-14	20 - 30	-2497	467 A	0.028	0.23	9
-14	30 - 40	-2498	822 D	0.073	0.11	15
-14	50 - 60	-2500	825 E	0.026	0.05	39
-14	60 - 70	-2501				
-14	190 - 200	-2514	826 D	0.008	0.03	39
75-GLE-15	60 - 70	-2520	826 E	0.018	0.05	29
-15	80 - 90	-2522	824 F	0.065	0.05	39
-15	90 - 100	-2523	791 B	0.060	0.04	31
-15	100 - 110	-2524	494 H	0.028	0.03	15
-15	110 - 120	-2525	826 F	0.017	0.03	20
-15	130 - 140	-2527	821 C	0.054	0.05	72
-15	140 - 150	-2528	837 C	0.015	0.02	45
-15	150 - 160	-2529	820 C	0.041	0.02	23
-15	160 - 170	-2530	820 D	0.037	0.02	33

24-Hr Bottle Roll Tests
on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Cyanide Soluble Ag oz/ton	Cyanide Soluble Cu, p[illegible]
75-GLE-16	140 - 150	75-GLE-2551	827 C	0.075	0.03	9
-16	160 - 170	-2553	547 C	0.008	0.00	14
-16	170 - 180	-2554	820 E	0.074	0.02	13
-16	180 - 190	-2555	547 D	0.038	0.03	23
-16	200 - 210	-2557	844 E	0.088	0.04	277
-16	210 - 220	-2558	484 G	0.051	0.06	81
-16	220 - 230	-2559	480 B	0.010	0.01	51
75-GLE-18	80 - 90	-2599	462 B	0.069	0.09	25
75-GLE-20	100 - 110	-2633	820 F	0.044	0.04	51
-20	110 - 120	-2634	820 G	0.090	0.04	2[illegible]
-20	130 - 140	-2636				
75-GLE-21	5 - 10	-2643	482 A	0.031	0.05	[illegible]
-21	10 - 20	-2644	476 B	0.088	0.08	[illegible]
-21	20 - 30	-2645	482 B	0.063	0.04	[illegible]
-21	30 - 40	-2646	484 H	0.018	0.01	2[illegible]
-21	40 - 50	-2647	841 D	0.197	0.02	[illegible]
-21	60 - 70	-2649	482 C	0.068	0.02	2[illegible]
-21	70 - 80	-2650	820 H	0.304	0.07	1[illegible]
-21	90 - 100	-2652	825 F	0.062	0.03	1[illegible]
75-GLE-22	110 - 120	-2674	476 C	0.028	0.25	3[illegible]
75-GLE-23	130 - 140	-2696	485 A	0.034	0.04	1[illegible]
-23	140 - 150	-2697	841 E	0.157	0.04	1[illegible]
-23	150 - 160	-2698	482 D	0.018	0.01	
-23	170 - 180	-2700	482 E	0.037	0.01	
-23	180 - 190	-2701	482 F	0.031	0.01	
-23	190 - 195	-2702	476 D	0.023	0.08	[illegible]

24-Hr Bottle Roll Tests
on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Ag oz/ton	Cu, ppm
75-GLE-24	210 - 220	75-GLE-2724	844 F	0.061	0.04	27
-24	230 - 240	-2726	841 F	0.132	0.04	42
-24	240 - 250	-2727	482 G	0.007	0.01	30
-24	250 - 260	-2728	482 H	0.011	0.01	21
-24	260 - 270	-2729	462 C	0.041	0.03	30
-24	270 - 280	-2730	462 D	0.027	0.02	19
-24	280 - 290	-2731	483 A	0.039	0.01	12
-24	290 - 300	-2732	476 E	0.121	0.03	17
75-GLE-25	60 - 70	-2739	836 G	0.043	0.02	6
-25	70 - 80	-2740	839 E	0.103	0.02	7
-25	80 - 90	-2741	841 G	0.248	0.03	5
-25	100 - 110	-2743	836 H	0.008	0.01	6
-25	110 - 120	-2744	826 G	0.021	0.02	5
-25	120 - 130	-2745	483 B	0.037	0.01	2
-25	140 - 150	-2747	820 I	0.100	0.02	8
-25	160 - 170	-2749	820 J	0.035	0.03	16
-25	170 - 180	-2750				
-25	190 - 200	-2752	476 F	0.046	0.05	23
75-GLE-27	2 - 10	-2783	547 E	0.009	0.01	9
-27	10 - 20	-2784	819 A	0.022	0.01	28
-27	40 - 50	-2787	547 F	0.032	0.01	9
-27	60 - 70	-2789	825 G	0.031	0.01	30
-27	70 - 80	-2790	485 B	0.005	0.01	11
-27	80 - 90	-2791	476 G	0.127	0.02	11
-27	100 - 110	-2793	485 C	0.051	0.03	15
-27	110 - 120	-2794				

24-Hr Bottle Roll Tests
on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Ag oz/ton	Cu, ppm
75-GLE-29	5 - 10	75-GLE-2833	551 F	0.023	0.02	5
-29	10 - 20	-2834	485 D	0.007	0.02	6
-29	20 - 30	-2835	550 F	0.007	0.01	5
-29	30 - 40	-2836	485 E	0.034	0.02	16
-29	40 - 50	-2837	550 G	0.039	0.01	6
-29	50 - 60	-2838	548 G	0.017	0.03	8
75-GLE-33	80 - 90	-2936				
-33	90 - 100	-2937	476 H	0.031	0.02	29
75-GLE-34	50 - 60	-2944	838 G	0.021	0.07	8
-34	70 - 80	-2946				
-34	80 - 90	-2947	836 I	0.007	0.08	119
-34	100 - 110	-2949	480 C	0.012	0.08	75
-34	110 - 120	-2950	841 H	0.011	0.06	16
-34	120 - 130	-2951	837 D	0.005	0.07	17
-34	130 - 140	-2952	841 I	0.009	0.14	18
75-GLE-36	20 - 30	-2981	483 C	0.003	0.03	17
-36	30 - 40	-2982	548 H	0.018	0.04	18
-36	40 - 50	-2983	485 F	0.024	0.05	126
-36	50 - 60	-2984	485 G	0.021	0.04	40
-36	60 - 70	-2985	837 E	0.010	0.03	76
-36	70 - 80	-2986	820 K	0.006	0.02	48
-36	80 - 90	-2987	485 H	0.004	0.02	89
75-GLE-38	2 - 10	-3000	838 H	0.028	0.05	17
-38	20 - 30	-3002				

24-Hr Bottle Roll Tests
on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Ag oz/ton	Cu, ppm
75-GLE-39	2 - 10	75-GLE-3026				
-39	10 - 20	-3027	841 J	0.017	0.07	7
-39	20 - 30	-3028	824 H	0.026	0.05	9
-39	30 - 40	-3029	547 A	0.047	0.11	11
-39	40 - 50	-3030	844 G	0.043	0.10	18
-39	50 - 60	-3031	826 H	0.032	0.05	17
-39	60 - 70	-3032	844 H	0.021	0.07	18
75-GLE-40	10 - 20	-3053	820 L	0.034	0.08	33
-40	30 - 40	-3055	480 D	0.016	0.08	48
-40	40 - 50	-3056	480 E	0.007	0.06	66
-40	50 - 60	-3057				
75-GLE-41	140 - 150	-3087	792 A	0.016	0.03	24
-41	150 - 160	-3088	795 A	0.044	0.02	13
-41	160 - 170	-3089	836 J	0.014	0.03	13
-41	170 - 180	-3090	792 B	0.026	0.04	14
-41	180 - 190	-3091	837 F	0.025	0.03	10
-41	190 - 200	-3092	821 E	0.029	0.03	15
75-GLE-42	50 - 60	-3120				
-42	60 - 70	-3121	826 I	0.024	0.07	93
-42	70 - 80	-3122	838 I	0.022	0.06	196
-42	110 - 120	-3126				
-42	120 - 130	-3127	838 J	0.015	0.00	26
-42	130 - 140	-3128	827 D	0.027	0.04	17
-42	140 - 150	-3129	825 H	0.043	0.04	18
-42	150 - 160	-3130	825 I	0.037	0.04	51
-42	160 - 170	-3131	826 J	0.024	0.10	24

24-Hr Bottle Roll Tests on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble		
				Au oz/ton	Ag oz/ton	Cu, pp
75-GLE-42	280 - 290	75-GLE-3143				
-42	290 - 300	-3144	551 G	0.299	0.62	18
-42	300 - 310	-3145	547 H	0.026	0.04	24
-42	310 - 320	-3146	550 H	0.022	0.02	25
-42	320 - 330	-3147	822 E	0.029	0.04	60
-42	330 - 340	-3148	547 G	0.010	0.03	52
76-GLE-44	20 - 30	76-65-329				
-44	40 - 50	-331	486 A	0.001	0.00	16
-44	50 - 60	-332	822 A	0.006	0.01	26
-44	60 - 70	-333				
-44	80 - 90	-335	486 B	0.000	0.01	17
-44	170 - 180	-344	823 F	0.005	0.29	66
-44	180 - 190	-345				
-44	250 - 260	-352	552 B	0.121	0.04	39
76-GLE-45	130 - 140	-366				
-45	140 - 150	-367	492 A	0.071	0.03	10
-45	160 - 170	-369	486 C	0.019	0.01	12
-45	180 - 190	-371	492 B	0.013	0.01	12
76-GLE-46	0 - 10	-377	552 C	0.027	0.05	6
-46	10 - 20	-378	492 C	0.022	0.03	6
-46	20 - 30	-379	492 D	0.014	0.02	11
-46	30 - 40	-380	552 D	0.016	0.01	6
-46	40 - 50	-381	486 D	0.025	0.02	8
-46	50 - 60	-382	549 A	0.033	0.03	4
-46	60 - 70	-383	815 A	0.133	0.19	12
-46	70 - 80	-384	549 B	0.076	0.05	4
-46	90 - 100	-386	492 E	0.182	0.10	8

24-Hr Bottle Roll Tests
on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Ag oz/ton	Cu, ppm
76-GLE-46	100 - 110	76-65-387	552 E	0.118	0.08	8
-46	110 - 120	-388	819 B	0.499	0.13	36
-46	150 - 160	-392	823 I	0.102	0.06	21
-46	170 - 180	-394	552 F	0.123	0.08	8
-46	180 - 190	-395	552 G	0.032	0.03	16
-46	190 - 200	-396	486 E	0.451	0.37	20
-46	200 - 210	-397	486 F	0.113	0.14	94
-46	210 - 220	-398	486 G	0.027	0.38	208
-46	230 - 240	-400	549 C	0.040	0.20	60
76-GLE-47	80 - 90	-409	492 F	0.027	0.07	7
-47	90 - 100	-410	492 G	0.048	0.06	4
-47	100 - 110	-411	492 H	0.028	0.09	5
-47	140 - 150	-415	486 H	0.016	0.03	18
-47	210 - 220	-422	487 A	0.005	0.05	7
-47	250 - 260	-426	747 A	0.015	0.02	8
-47	270 - 280	-428	493 A	0.127	0.04	26
-47	280 - 290	-429	487 F	0.166	0.05	46
-47	290 - 300	-430	549 D	0.094	0.10	23
-47	310 - 320	-432	493 B	0.120	0.11	23
-47	320 - 330	-433	819 H	0.102	0.12	51
-47	330 - 340	-434	487 B	0.056	0.12	525
-47	340 - 350	-435	826 A	0.073	0.20	96
76-GLE-48	40 - 50	-440	487 C	0.018	0.04	15
-48	50 - 60	-441	487 D	0.008	0.04	14
-48	60 - 70	-442	487 E	0.018	0.03	22

24-Hr Bottle Roll Tests on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Cyanide Soluble Ag oz/ton	Cyanide Soluble Cu, ppm
76-GLE-52	130 - 140	76-65-540				
-52	160 - 170	-543	549 E	0.028	0.19	9
-52	170 - 180	-544	827 A	0.053	0.23	9
-52	180 - 190	-545	493 C	0.083	0.31	14
-52	190 - 200	-546	493 D	0.070	0.09	23
-52	200 - 205	-547	819 B	0.070	0.13	36
76-GLE-55	180 - 190	-624	493 E	0.028	0.30	52
-55	190 - 200	-625	814 A	0.027	0.36	66
-55	200 - 210	-626	493 F	0.029	0.14	52
-55	210 - 220	-627	548 A	0.050	0.20	66
-55	220 - 230	-628	493 G	0.053	0.35	49
-55	230 - 240	-629	747 B	0.022	0.17	60
-55	240 - 250	-630	821 A	0.018	0.13	72
-55	250 - 260	-631	493 H	0.015	0.06	49
76-GLE-56	20 - 30	-634	487 G	0.023	0.25	3
-56	30 - 40	-635	815 C	0.038	0.28	7
-56	40 - 50	-636	837 G	0.054	0.37	7
-56	100 - 110	-642	494 A	0.081	0.39	51
-56	110 - 120	-643	487 H	0.009	0.11	626
-56	120 - 130	-644	494 B	0.011	0.00	52
-56	140 - 150	-646	494 C	0.024	0.15	52
-56	200 - 210	-652	815 D	0.009	0.00	84
-56	210 - 220	-653	747 C	0.063	0.21	60
-56	220 - 230	-654				
-56	230 - 240	-655	494 D	0.012	0.15	52
-56	240 - 250	-656	837 H	0.020	0.13	440

24-Hr Bottle Roll Tests on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Ag oz/ton	Cu, p
76-GLE-57	0 - 10	76-65-657	833 E	0.023	0.14	296
-57	100 - 110	-667	839 F	0.035	0.18	898
-57	120 - 130	-669	814 B	0.049	0.34	72
-57	160 - 170	-673	549 F	0.017	0.17	57
-57	170 - 180	-674	820 A	0.027	0.19	84
-57	180 - 190	-675	747 D	0.036	0.14	60
-57	190 - 200	-676	494 E	0.041	0.16	52
76-GLE-58	0 - 10	-677	462 E	0.020	0.08	13
-58	10 - 20	-678	457 D	0.024	0.05	11
-58	20 - 30	-679	459 D	0.014	0.01	28
-58	30 - 40	-680	467 B	0.020	0.08	11
-58	40 - 50	-681	463 A	0.014	0.11	24
-58	50 - 60	-682	467 C	0.019	0.08	13
-58	60 - 70	-683	467 D	0.017	0.03	27
-58	70 - 80	-684	462 F	0.010	0.03	22
-58	80 - 90	-685	467 E	0.026	0.06	22
-58	90 - 100	-686	814 C	0.026	0.04	60
-58	100 - 110	-687	810 B	0.077	0.06	67
-58	110 - 120	-688	823 D	0.030	0.08	72
-58	120 - 130	-689	810 C	0.028	0.00	108
-58	130 - 140	-690	833 F	0.016	0.07	356
-58	140 - 150	-691	791 C	0.014	0.07	72
-58	150 - 160	-692	821 G	0.012	0.12	72
-58	160 - 170	-693	809 B	0.018	0.12	96
-58	180 - 190	-695	456 A	0.004	0.19	33
-58	190 - 200	-696	467 F	0.003	0.15	45
-58	200 - 210	-697	821 B	0.009	0.44	45
-58	210 - 220	-698	819 J	0.007	0.00	72

24-Hr Bottle Roll Tests
on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Ag oz/ton	Cu, pp
76-GLE-59	0 - 10	76-65-703	456 B	0.049	0.20	19
-59	10 - 20	-704	456 C	0.031	0.09	24
-59	20 - 30	-705	456 D	0.048	0.15	14
-59	30 - 40	-706	457 E	0.017	0.11	13
-59	40 - 50	-707	456 E	0.013	0.07	17
-59	60 - 70	-709	459 E	0.019	0.02	14
-59	70 - 80	-710	814 D	0.033	0.08	60
-59	110 - 120	-714	548 B	0.058	0.02	24
-59	170 - 180	-720	839 G	0.015	0.06	45
-59	180 - 190	-721	815 E	0.015	0.06	60
-59	190 - 200	-722	747 E	0.024	0.09	36
76-GLE-60	0 - 10	-723	461 A	0.022	0.02	14
-60	10 - 20	-724	465 A	0.030	0.02	6
-60	20 - 30	-725	465 B	0.036	0.02	4
-60	30 - 40	-726	468 A	0.011	0.04	4
-60	40 - 50	-727	468 B	0.029	0.03	4
-60	50 - 60	-728	468 C	0.038	0.02	4
-60	60 - 70	-729	468 D	0.018	0.02	6
-60	70 - 80	-730	461 B	0.011	0.01	9
-60	80 - 90	-731	795 B	0.012	0.02	6
-60	90 - 100	-732	822 G	0.052	0.03	8
76-GLE-62	20 - 30	-777	823 J	0.032	0.10	57
-62	30 - 40	-778	548 C	0.126	0.08	11
-62	40 - 50	-779	549 G	0.051	0.05	8
-62	50 - 60	-780	483 E	0.370	0.13	19
-62	60 - 70	-781	747 F	0.059	0.10	8
-62	70 - 80	-782	747 G	0.031	0.10	10
-62	80 - 90	-783	475 A	0.030	0.11	9

24-Hr Bottle Roll Tests
on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Cyanide Soluble Ag oz/ton	Cu, |
76-CLE-62	120 - 130	76-65-787	457 F	0.138	0.09	13
-62	150 - 160	-790	795 C	0.063	0.08	18
-62	160 - 170	-791	455 A	0.085	0.06	12
-62	170 - 180	-792	792 D	0.019	0.00	27
-62	190 - 200	-794	455 B	0.017	0.02	5
-62	200 - 210	-795	455 C	0.044	0.02	7
-62	210 - 220	-796	455 D	0.023	0.02	6
-62	220 - 230	-797	459 F	0.017	0.01	18
-62	230 - 240	-798	457 G	0.025	0.01	4
-62	240 - 250	-799	455 E	0.013	0.01	6
-62	250 - 260	-800	459 G	0.004	0.01	9
-62	260 - 270	-801	455 F	0.003	0.01	17
-62	270 - 280	-802	457 H	0.006	0.02	14
76-CLE-64	70 - 80	-830	791 D	0.079	0.08	60
-64	80 - 90	-831	795 D	0.035	0.11	66
-64	90 - 100	-832	455 G	0.030	0.08	33
-64	100 - 110	-833	792 E	0.004	0.11	78
-64	110 - 120	-834	455 H	0.039	0.13	33
-64	120 - 130	-835	455 I	0.031	0.09	33
-64	130 - 140	-836	455 J	0.017	0.07	33
-64	140 - 150	-837	455 K	0.027	0.07	33
-64	150 - 160	-838	460 A	0.018	0.06	31
-64	160 - 170	-839	456 F	0.016	0.09	28
-64	170 - 180	-840	809 C	0.023	0.05	93
-64	180 - 190	-841	810 D	0.048	0.04	75
-64	190 - 200	-842	814 E	0.043	0.12	72
-64	200 - 210	-843	795 E	0.008	0.00	66
-64	210 - 220	-844	810 E	0.027	0.00	60
-64	220 - 230	-845	810 F	0.026	0.00	60

24-Hr Bottle Roll Tests on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Cyanide Soluble Ag oz/ton	Cu, I
76-GLE-64	230 - 240	76-65-846	809 D	0.022	0.00	96
-64	240 - 250	-847	809 E	0.019	0.00	96
-64	250 - 260	-848	809 F	0.021	0.00	96
-64	260 - 270	-849	814 F	0.004	0.00	66
-64	270 - 280	-850	792 F	0.039	0.00	72
-64	280 - 290	-851	792 G	0.012	0.00	72
76-GLE-66	0 - 10	-878	462 G	0.037	0.07	12
-66	10 - 20	-879	479 H	0.036	0.02	6
-66	20 - 30	-880	479 E	0.006	0.01	4
-66	30 - 40	-881	479 F	0.007	0.01	3
-66	40 - 50	-882	479 G	0.020	0.01	9
-66	50 - 60	-883	824 I	0.022	0.03	11
-66	140 - 150	-892	791 E	0.034	0.21	72
-66	150 - 160	-893	821 F	0.024	0.19	84
-66	160 - 170	-894	822 H	0.025	0.28	84
-66	170 - 180	-895	839 H	0.033	0.26	172
76-GLE-67	90 - 100	-912	747 H	0.063	0.02	20
-67	100 - 110	-913	481 A	0.019	0.01	3
-67	110 - 120	-914	483 F	0.021	0.58	1
-67	140 - 150	-917	483 G	0.015	0.06	1
-67	150 - 160	-918	821 I	0.020	0.02	19
-67	160 - 170	-919	839 I	0.022	0.03	8
-67	170 - 180	-920	475 B	0.014	0.04	3
-67	180 - 190	-921	810 G	0.056	0.03	90
-67	190 - 200	-922	822 I	0.004	0.00	8

24-Hr Bottle Roll Tests
on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Ag oz/ton	Cu, ppm
76-GLE-68	230 - 240	76-65-948				
-68	240 - 250	-949	481 B	0.004	0.05	45
76-GLE-69	220 - 230	-973	844 I	0.001	0.01	43
-69	230 - 240	-974				
-69	240 - 250	-975				
-69	260 - 270	-977	483 H	0.010	0.04	75
-69	270 - 280	-978	748 A	0.017	0.04	60
-69	320 - 330	-983	484 A	0.014	0.04	81
-69	330 - 340	-984	475 C	0.041	0.12	27
76-GLE-70	90 - 100	-994	791 F	0.021	0.01	22
-70	100 - 110	-995	792 H	0.015	0.00	29
-70	110 - 120	-996	823 H	0.001	0.00	39
-70	120 - 130	-997	792 I	0.037	0.08	9
76-GLE-71	40 - 50	-1014	823 C	0.018	0.05	25
-71	50 - 60	-1015	822 B	0.015	0.00	54
-71	60 - 70	-1016	814 G	0.019	0.09	12
-71	70 - 80	-1017	815 F	0.018	0.08	108
-71	80 - 90	-1018	814 H	0.104	0.11	66
-71	90 - 100	-1019	463 C	0.024	0.06	39
-71	100 - 110	-1020	463 D	0.019	0.07	28
-71	110 - 120	-1021	467 G	0.016	0.07	8
-71	120 - 130	-1022	461 C	0.010	0.04	12
-71	130 - 140	-1023	460 B	0.024	0.07	33
-71	140 - 150	-1024	461 D	0.011	0.12	36
-71	150 - 160	-1025	461 E	0.005	0.00	31
-71	160 - 170	-1026	461 F	0.006	0.00	36

24-Hr Bottle Roll Tests
on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Cyanide Soluble Ag oz/ton	Cyanide Soluble Cu, ppm
76-GLE-71	170 - 180	76-65-1027	461 G	0.004	0.00	36
-71	180 - 190	-1028	461 H	0.005	0.00	34
-71	190 - 200	-1029	791 G	0.011	0.00	42
-71	200 - 210	-1030	795 F	0.006	0.00	45
-71	210 - 220	-1031	822 J	0.032	0.15	84
-71	220 - 230	-1032	810 H	0.032	0.00	108
-71	230 - 240	-1033				
-71	240 - 250	-1034	795 G	0.007	0.06	72
-71	250 - 260	-1035	791 H	0.005	0.00	66
-71	270 - 280	-1037	814 I	0.001	0.00	17
-71	280 - 290	-1038	809 G	0.024	0.00	96
76-GLE-72	0 - 10	-1039	748 B	0.022	0.04	1
-72	10 - 20	-1040	475 D	0.039	0.12	27
-72	20 - 30	-1041	748 C	0.015	0.05	11
-72	30 - 40	-1042	748 D	0.021	0.05	18
-72	40 - 50	-1043	834 I	0.037	0.06	22
-72	50 - 60	-1044	748 E	0.122	0.12	14
-72	60 - 70	-1045	480 A	0.078	0.09	15
-72	70 - 80	-1046	484 B	0.381	0.15	17
76-GLE-74	100 - 110	-1101	837 I	0.035	0.47	15
-74	140 - 150	-1105	834 J	0.105	0.25	133
-74	150 - 160	-1106	823 B	0.015	0.21	33
-74	170 - 180	-1108	809 H	0.077	1.04	96
-74	180 - 190	-1109	839 J	0.016	0.25	43

24-Hr Bottle Roll Tests on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Cyanide Soluble Ag oz/ton	Cyanide Soluble Cu, pp[illegible]
76-GLE-75	50 - 60	76-65-1120	795 I	0.036	0.12	13
-75	60 - 70	-1121	809 I	0.049	0.15	45
-75	250 - 260	-1140	837 J	0.049	0.59	217
-75	260 - 270	-1141	814 J	0.023	0.00	72
76-GLE-76	0 - 10	-1144	824 J	0.018	0.05	8
-76	10 - 20	-1145	484 C	0.015	0.06	8
-76	20 - 30	-1146	748 F	0.015	0.05	5
-76	30 - 40	-1147	484 D	0.042	0.07	19
-76	40 - 50	-1148	548 D	0.055	0.14	23
-76	50 - 60	-1149	825 J	0.032	0.08	21
-76	60 - 70	-1150	548 E	0.076	0.07	23
-76	80 - 90	-1152	458 A	0.012	0.04	12
-76	90 - 100	-1153	791 I	0.012	0.06	45
-76	100 - 110	-1154	810 I	0.038	0.04	60
-76	110 - 120	-1155	791 J	0.018	0.04	16
-76	120 - 130	-1156	460 C	0.010	0.00	31
-76	130 - 140	-1157	809 J	0.103	0.10	37
-76	140 - 150	-1158	456 G	0.081	0.05	28
76-GLE-78	0 - 10	-1201	458 B	0.016	0.05	15
-78	10 - 20	-1202	460 D	0.009	0.05	27
-78	20 - 30	-1203	458 C	0.026	0.05	31
-78	30 - 40	-1204	458 D	0.028	0.11	1[illegible]
-78	40 - 50	-1205	458 E	0.024	0.13	1[illegible]
-78	50 - 60	-1206	458 F	0.027	0.08	3[illegible]
-78	60 - 70	-1207	460 E	0.012	0.00	3[illegible]
-78	70 - 80	-1208	460 F	0.003	0.00	3[illegible]

24-Hr Bottle Roll Tests
on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Ag oz/ton	Cu, p
76-GLE-80	50 - 60	76-65-1249	819 C	0.064	0.04	7
-80	60 - 70	-1250	792 J	0.056	0.09	22
-80	70 - 80	-1251	823 G	0.010	0.12	8
-80	80 - 90	-1252	481 C	0.006	0.20	28
-80	90 - 100	-1253	819 E	0.027	0.09	11
-80	100 - 110	-1254	748 G	0.040	0.07	6
-80	110 - 120	-1255	548 F	0.045	0.08	33
-80	120 - 130	-1256	484 E	0.018	0.41	51
-80	130 - 140	-1257	484 F	0.039	0.58	18
-80	140 - 150	-1258	549 H	0.023	0.43	58
-80	150 - 160	-1259	819 G	0.016	0.08	72
-80	160 - 170	-1260	748 H	0.025	0.44	60
76-GLE-81	90 - 100	-1284	458 H	0.014	0.83	14
-81	100 - 110	-1285	460 G	0.010	0.65	21
-81	110 - 120	-1286	456 H	0.014	0.60	34
-81	120 - 130	-1287	456 I	0.007	0.01	34
-81	130 - 140	-1288	456 J	0.008	0.22	34
-81	150 - 160	-1290	459 A	0.014	0.22	33
-81	160 - 170	-1291	459 B	0.013	0.10	34
-81	170 - 180	-1292	459 C	0.021	0.00	34
76-GLE-87	0 - 10	77-GLE-123	795 J	0.009	0.08	17
-87	10 - 20	-124	810 J	0.215	0.20	23
-87	20 - 30	-125	457 A	0.073	0.09	10
-87	30 - 40	-126	457 B	0.013	0.09	10
-87	40 - 50	-127	457 C	0.017	0.20	14
-87	50 - 60	-128	458 G	0.070	0.17	6
-87	60 - 70	-129	479 A	0.041	0.18	69
-87	70 - 80	-130	479 B	0.109	0.18	72
-87	80 - 90	-131	479 C	0.053	0.32	72
-87	90 - 100	-132	479 D	0.066	0.76	72

24-Hr Bottle Roll Tests on Pulverized Drill Hole Samples

RDH No.	Interval (feet)	Cyprus No.	Miller-Kappes Test No.	Cyanide Soluble Au oz/ton	Ag oz/ton	Cu, pp
78-GLE-105	0 - 10	78-GLE-68	463 E	0.028	0.15	13
-105	10 - 20	-69	477 A	0.012	0.11	39
-105	20 - 30	-70	477 B	0.070	0.09	8
-105	30 - 40	-71	477 C	0.045	0.12	11
-105	40 - 50	-72	477 D	0.044	0.17	11
-105	50 - 60	-73	477 E	0.034	0.19	10
-105	60 - 70	-74	477 F	0.021	0.11	8
-105	70 - 80	-75	477 G	0.018	0.07	13
-105	80 - 90	-76	477 H	0.021	0.07	9
-105	90 - 100	-77	478 A	0.040	0.16	8
78-GLE-106	0 - 10	-88	478 B	0.035	0.16	8
-106	10 - 20	-89	478 C	0.018	0.12	67
-106	20 - 30	-90	478 D	0.038	0.37	54
-106	30 - 40	-91	478 E	0.089	0.31	70
-106	40 - 50	-92	463 F	0.038	0.12	14
-106	50 - 60	-93	478 F	0.018	0.31	75
-106	60 - 70	-94	463 G	0.014	0.06	9
-106	70 - 80	-95	478 G	0.013	0.17	75
-106	80 - 90	-96	478 H	0.013	0.23	75
-106	90 - 100	-97	469 E	0.053	0.06	4

24-Hr. Bottle Roll Tests
on Drill Hole Samples

Comparison of Pulverized versus Unpulverized

RDH No.	Interval (feet)	Assay Head oz. Au/ton	Pulverized Tests: oz/ton Au Recovered	Pulverized Tests: Calculated Head Assay oz/ton	Unpulverized Tests: oz/ton Au Recovered	Unpulverized Tests: Calculated Head Assay oz/ton
75-GLE-1	2- 10	0.090	0.056	0.065	0.051	0.079
-1	25- 30	0.135	0.102	0.133	0.076	0.133
-1	40- 50	0.095	0.032	0.099	0.056	0.100
-1	50- 60	0.080	0.030	0.072	0.037	0.073
-1	60- 70	0.100	0.071	0.083	0.049	0.073
-1	70- 80	0.040	0.020	0.044	0.020	0.034
-1	90-100	0.040	0.033	0.048	0.025	0.049
-1	100-110	0.050	0.018	0.043	0.026	0.046
-1	120-130	0.090	0.121	0.195	0.009	0.086
-1	130-140	0.085	0.014	0.090	0.021	0.085
-1	140-150	0.040	0.023	0.033	0.028	0.038
75-GLE-2	2- 10	0.295	0.239	0.263	0.239	0.239
-2	20- 30	0.095	0.042	0.114	0.092	0.116
-2	70- 80	0.050	0.057	0.067	0.036	0.064
75-GLE-3	10- 20	0.040	0.047	0.050	0.051	0.054
-3	50- 60	0.035	0.039	0.042	0.048	0.056
-3	60- 70	0.015	0.011	0.011	0.012	0.108
-3	90-100	0.025	0.033	0.042	0.017	0.035
-3	110-120	0.035	0.040	0.050	0.028	0.052
-3	160-170	0.050	0.006	0.050	0.022	0.059
-3	170-180	0.050	0.028	0.052	0.022	0.056
75-GLE-4	10- 20	0.050	0.070	0.080	0.039	0.049
-4	20- 20	0.065	0.047	0.052	0.043	0.058
-4	50- 60	0.030	0.019	0.039	0.008	0.025
-4	70- 80	0.020	0.014	0.026	0.013	0.022
-4	80- 90	0.040	0.026	0.040	0.015	0.043

24-Hr. Bottle Roll Tests
on Drill Hole Samples

Comparison of Pulverized versus Unpulverized

			Pulverized Tests		Unpulverized Tests	
RDH No.	Interval (feet)	Assay Head oz. Au/ton	oz/ton Au Recovered	Calculated Head Assay oz/ton	oz/ton Au Recovered	Calculated Head Assay oz/ton
75-GLE-5	50- 60	0.010	0.011	0.014	0.004	0.007
75-GLE-6	2- 10	0.035	0.024	0.029	0.021	0.021
-6	10- 20	0.090	0.164	0.174	0.143	0.155
-6	20- 30	0.075	0.077	0.082	0.075	0.091
-6	30- 40	0.075	0.059	0.062	0.054	0.054
-6	50- 60	0.070	0.032	0.090	0.028	0.028
75-GLE-7	140-150	0.050	0.035	0.045	0.026	0.038
-7	160-170	0.044	0.044	0.056	0.036	0.048
75-GLE-8	270-280	0.050	0.017	0.051	0.046	0.065
75-GLE-10	140-150	0.016	0.015	0.025	0.008	0.022
-10	150-160	0.028	0.007	0.031	0.010	0.038
75-GLE-11	150-160	0.038	0.016	0.031	0.023	0.038
75-GLE-12	190-200	0.058	0.014	0.034	0.018	0.026
75-GLE-13	25- 30	0.038	0.053	0.060	0.030	0.040
-13	150-160	0.103	0.051	0.062	0.017	0.047
-13	160-170	0.046	0.026	0.048	0.026	0.054
-13	180-190	0.028	0.022	0.033	0.011	0.035
75-GLE-14	2- 10	0.024	0.018	0.021	0.011	0.295
-14	20- 30	0.034	0.028	0.037	0.033	0.038
-14	30- 40	0.065	0.073	0.078	0.052	0.062
-14	50- 60	0.020	0.026	0.032	0.019	0.029
-14	190-200	0.012	0.008	0.013	0.005	0.014

24-Hr. Bottle Roll Tests
on Drill Hole Samples

Comparison of Pulverized versus Unpulverized

			Pulverized Tests		Unpulverized Tests	
RDH No.	Interval (feet)	Assay Head oz. Au/ton	oz/ton Au Recovered	Calculated Head Assay oz/ton	oz/ton Au Recovered	Calculated Head Assay oz/ton
75-GLE-15	60- 70	0.012	0.018	0.021	0.011	0.014
-15	80- 90	0.062	0.065	0.068	0.057	0.070
-15	90-100	0.058	0.060	0.063	0.048	0.066
-15	100-110	0.038	0.028	0.031	0.034	0.046
-15	110-120	0.020	0.017	0.020	0.019	0.029
-15	130-140	0.038	0.054	0.057	0.051	0.060
-15	140-150	0.026	0.015	0.018	0.017	0.020
-15	150-160	0.032	0.041	0.044	0.035	0.051
-15	160-170	0.038	0.037	0.042	0.028	0.038
75-GLE-16	140-150	0.054	0.075	0.085	0.040	0.052
-16	170-180	0.076	0.074	0.077	0.067	0.070
-16	200-210	0.102	0.088	0.091	0.072	0.102
-16	220-230	0.022	0.010	0.021	0.021	0.026
75-GLE-20	100-110	0.042	0.044	0.053	0.029	0.047
-20	110-220	0.102	0.090	0.116	0.082	0.110
75-GLE-21	10- 20	0.092	0.088	0.101	0.103	0.126
-21	40- 50	0.450	0.198	0.212	0.042	0.080
-21	70- 80	0.482	0.305	0.327	0.124	0.214
-21	90-100	0.040	0.062	0.067	0.031	0.034
75-GLE-22	110-120	0.016	0.028	0.093	0.049	0.052
75-GLE-23	140-150	0.062	0.157	0.160	0.038	0.060
-23	190-195	0.114	0.023	0.088	0.068	0.112
75-GLE-24	210-220	0.066	0.061	0.061	0.053	0.056
-24	230-240	0.024	0.132	0.135	0.014	0.017
-24	290-300	0.165	0.122	0.135	0.138	0.149

24-Hr. Bottle Roll Tests
on Drill Hole Samples

Comparison of Pulverized versus Unpulverized

RDH No.	Interval (feet)	Assay Head oz. Au/ton	Pulverized Tests oz/ton Au Recovered	Pulverized Tests Calculated Head Assay oz/ton	Unpulverized Tests oz/ton Au Recovered	Unpulverized Tests Calculated Head Assay oz/ton
75-GLE-25	60-70	0.042	0.043	0.046	0.043	0.055
-25	100-110	0.012	0.008	0.011	0.012	0.017
-25	140-150	0.090	0.100	0.103	0.095	0.098
-25	190-200	0.060	0.046	0.053	0.050	0.055
75-GLE-27	10- 20	0.022	0.022	0.025	0.020	0.023
-27	60- 70	0.014	0.031	0.036	0.011	0.011
-27	80- 90	0.214	0.126	0.169	0.161	0.210
75-GLE-33	90-100	0.072	0.031	0.063	0.030	0.045
75-GLE-34	50- 60	0.024	0.021	0.024	0.019	0.033
-34	80- 90	0.016	0.007	0.010	0.004	0.009
-34	100-110	0.022	0.012	0.018	0.014	0.021
-34	110-120	0.020	0.011	0.014	0.008	0.020
-34	130-140	0.020	0.009	0.020	0.011	0.014
75-GLE-36	60- 70	0.026	0.010	0.013	0.008	0.011
-36	70- 80	0.010	0.006	0.009	0.002	0.012
75-GLE-39	10- 20	0.018	0.017	0.051	0.018	0.021
-39	20- 30	0.044	0.026	0.029	0.022	0.028
-39	30- 40	0.054	0.047	0.057	0.053	0.067
-39	40- 50	0.042	0.043	0.046	0.034	0.044
-39	50- 60	0.030	0.032	0.037	0.021	0.035
-39	60- 70	0.026	0.021	0.024	0.015	0.015
75-GLE-40	10- 20	0.030	0.034	0.041	0.034	0.044
-40	30- 40	0.030	0.016	0.031	0.028	0.033
-40	40- 50	0.020	0.007	0.019	0.012	0.020

24-Hr. Bottle Roll Tests
on Drill Hole Samples

Comparison of Pulverized versus Unpulverized

RDH No.	Interval (feet)	Assay Head oz. Au/ton	Pulverized Tests oz/ton Au Recovered	Pulverized Tests Calculated Head Assay oz/ton	Unpulverized Tests oz/ton Au Recovered	Unpulverized Tests Calculated Head Assay oz/ton
75-GLE-41	140-150	0.016	0.016	0.016	0.010	0.012
-41	150-160	0.044	0.044	0.047	0.045	0.055
-41	160-170	0.014	0.014	0.017	0.017	0.020
-41	170-180	0.022	0.026	0.029	0.018	0.022
-41	180-190	0.022	0.025	0.028	0.022	0.022
-41	190-200	0.034	0.029	0.034	0.024	0.027
75-GLE-42	60- 70	0.034	0.024	0.031	0.021	0.035
-42	120-130	0.044	0.019	0.043	0.037	0.045
-42	130-140	0.022	0.027	0.027	0.018	0.026
-42	140-150	0.042	0.043	0.049	0.040	0.051
-42	150-160	0.030	0.037	0.040	0.021	0.026
-42	160-170	0.030	0.024	0.027	0.020	0.032
-42	320-330	0.034	0.029	0.032	0.025	0.030
76-GLE-44	50- 60	None	0.006	0.006	0.002	0.005
-44	170-180	Trace	0.005	0.008	0.004	0.004
76-GLE-46	60- 70	0.080	0.133	0.148	0.080	0.150
-46	110-120	0.460	0.499	0.504	0.389	0.415
-46	150-160	0.440	0.102	0.105	0.133	0.147
-46	190-200	0.375	0.451	0.473	0.433	0.513
76-GLE-47	270-280	0.200	0.127	0.131	0.196	0.198
-47	280-290	0.090	0.166	0.192	0.070	0.090
-47	320-330	0.105	0.102	0.112	0.080	0.096
-47	340-350	0.070	0.073	0.084	0.047	0.082
76-GLE-48	40- 50	0.025	0.018	0.028	0.021	0.024

24-Hr. Bottle Roll Tests
on Drill Hole Samples

Comparison of Pulverized versus Unpulverized

RDH No.	Interval (feet)	Assay Head oz. Au/ton	Pulverized Tests oz/ton Au Recovered	Pulverized Tests Calculated Head Assay oz/ton	Unpulverized Tests oz/ton Au Recovered	Unpulverized Tests Calculated Head Assay oz/ton
76-GLE-52	170-180	0.046	0.053	0.059	0.044	0.058
76-GLE-55	180-190	0.025	0.028	0.031	0.013	0.031
-55	190-200	0.040	0.027	0.044	0.018	0.036
-55	240-250	0.015	0.018	0.025	0.009	0.021
76-GLE-56	30- 40	0.025	0.038	0.043	0.039	0.049
-56	40- 50	0.050	0.054	0.064	0.049	0.059
-56	140-150	0.040	0.024	0.040	0.021	0.041
-56	200-210	0.080	0.009	0.109	0.046	0.100
76-GLE-57	100-110	0.062	0.035	0.139	0.021	0.039
-57	120-130	0.080	0.049	0.075	0.034	0.066
-57	170-180	0.040	0.027	0.043	0.021	0.047
-57	190-200	0.120	0.041	0.075	0.049	0.097
76-GLE-58	30- 40	0.030	0.020	0.029	0.020	0.031
-58	50- 60	0.030	0.019	0.037	0.015	0.035
-58	60- 70	0.025	0.017	0.035	0.012	0.028
-58	80- 90	0.040	0.026	0.057	0.022	0.056
-58	90-100	0.040	0.026	0.037	0.010	0.034
-58	110-120	0.060	0.030	0.042	0.019	0.031
-58	120-130	0.050	0.028	0.065	0.016	0.042
-58	140-150	0.035	0.014	0.017	0.007	0.021
-58	150-160	0.030	0.012	0.019	0.008	0.026
-58	190-200	0.015	0.003	0.009	0.008	0.015
-58	200-210	0.020	0.009	0.015	0.005	0.019
-58	210-220	0.015	0.007	0.016	0.007	0.014

24-Hr. Bottle Roll Tests
on Drill Hole Samples

Comparison of Pulverized versus Unpulverized

RDH No.	Interval (feet)	Assay Head oz. Au/ton	Pulverized Tests: oz/ton Au Recovered	Pulverized Tests: Calculated Head Assay oz/ton	Unpulverized Tests: oz/ton Au Recovered	Unpulverized Tests: Calculated Head Assay oz/ton
76-GLE-59	70- 80	0.035	0.033	0.043	0.026	0.029
-59	170-180	0.020	0.015	0.018	0.015	0.027
-59	180-190	0.020	0.015	0.020	0.018	0.021
76-GLE-60	10- 20	0.030	0.030	0.035	0.030	0.037
-60	20- 30	0.030	0.036	0.039	0.015	0.020
-60	30- 40	0.020	0.011	0.016	0.010	0.015
-60	40- 50	0.040	0.029	0.035	0.018	0.025
-60	50- 60	0.030	0.038	0.043	0.031	0.036
-60	60- 70	0.030	0.018	0.021	0.024	0.027
-60	80- 90	0.010	0.012	0.012	0.014	0.014
-60	90-100	0.055	0.052	0.057	0.030	0.040
76-GLE-62	20- 30	0.020	0.032	0.038	0.033	0.036
-62	80- 90	0.040	0.030	0.033	0.043	0.046
-62	170-180	0.050	0.019	0.047	0.034	0.046
76-GLE-64	70- 80	0.090	0.079	0.082	0.042	0.066
-64	170-180	0.020	0.023	0.026	0.007	0.017
-64	190-200	0.040	0.043	0.059	0.023	0.053
-64	200-210	0.030	0.008	0.036	0.017	0.037
-64	240-250	0.035	0.019	0.075	0.029	0.043
-64	260-270	0.075	0.004	0.067	0.032	0.060
76-GLE-66	50- 60	0.005	0.022	0.025	0.019	0.031
-66	140-150	0.020	0.034	0.037	0.028	0.031
-66	150-160	0.025	0.024	0.030	0.012	0.054
-66	160-170	0.025	0.025	0.036	0.020	0.036
-66	170-180	0.040	0.033	0.045	0.027	0.051

24-Hr. Bottle Roll Tests
on Drill Hole Samples

Comparison of Pulverized versus Unpulverized

RDH No.	Interval (feet)	Assay Head oz. Au/ton	Pulverized Tests: oz/ton Au Recovered	Pulverized Tests: Calculated Head Assay oz/ton	Unpulverized Tests: oz/ton Au Recovered	Unpulverized Tests: Calculated Head Assay oz/ton
76-GLE-67	160-170	0.020	0.022	0.032	0.012	0.015
-67	170-180	0.020	0.014	0.028	0.019	0.035
-67	180-190	0.030	0.056	0.066	0.033	0.045
-67	190-200	0.045	0.004	0.027	0.035	0.045
76-GLE-69	220-230	Trace	0.001	0.001	0.003	0.006
-69	330-340	0.020	0.041	0.053	0.014	0.030
76-GLE-70	100-110	0.060	0.015	0.051	0.039	0.051
-70	110-120	0.020	0.001	0.014	0.019	0.041
-70	120-130	0.050	0.037	0.040	0.047	0.053
76-GLE-71	40- 50	0.020	0.018	0.023	0.010	0.020
-71	50- 60	0.080	0.015	0.072	0.056	0.164
-71	60- 70	0.025	0.019	0.025	0.021	0.024
-71	70- 80	0.025	0.018	0.021	0.018	0.021
-71	110-120	0.040	0.016	0.021	0.021	0.027
-71	210-220	0.030	0.032	0.041	0.019	0.057
-71	220-230	0.030	0.032	0.053	0.010	0.028
-71	250-260	0.010	0.005	0.008	0.003	0.005
-71	270-280	0.010	0.001	0.007	0.007	0.017
-71	280-290	0.010	0.024	0.034	0.001	0.003
76-GLE-72	10- 20	0.077	0.039	0.051	0.050	0.067
-72	60- 70	0.090	0.078	0.089	0.084	0.087
76-GLE-74	100-110	0.005	0.035	0.038	0.028	0.038
-74	150-160	0.045	0.015	0.015	0.009	0.012
-74	170-180	0.050	0.077	0.080	0.031	0.048
-74	180-190	0.020	0.016	0.019	0.012	0.015

24-Hr. Bottle Roll Tests
on Drill Hole Samples

Comparison of Pulverized versus Unpulverized

RDH No.	Interval (feet)	Assay Head oz. Au/ton	Pulverized Tests: oz/ton Au Recovered	Pulverized Tests: Calculated Head Assay oz/ton	Unpulverized Tests: oz/ton Au Recovered	Unpulverized Tests: Calculated Head Assay oz/ton
76-GLE-75	250-260	0.065	0.049	0.063	0.045	0.069
76-GLE-76	0- 10	0.015	0.018	0.021	0.014	0.026
-76	50- 60	0.025	0.032	0.035	0.026	0.031
-76	110-120	0.045	0.018	0.021	0.019	0.023
76-GLE-80	90- 100	0.022	0.027	0.030	0.021	0.024
-80	150-160	0.038	0.016	0.045	0.038	0.066
77-GLE-87	0- 10	0.015	0.009	0.009	0.009	0.012
-87	10- 20	0.140	0.215	0.225	0.183	0.471
78-GLE-105	0- 10	0.020	0.028	0.037	0.014	0.020
-105	40- 50	0.020	0.044	0.057	0.038	0.061
78-GLE-106	60- 70	0.020	0.014	0.021	0.015	0.023
-106	90-100	0.020	0.053	0.060	0.055	0.065

APPENDIX C TO GILT EDGE REPORT 1982 B

CYANIDE SOLUBLE COPPER IN BOTTLE ROLL TESTS ON

PULVERIZED RDH CUTTINGS

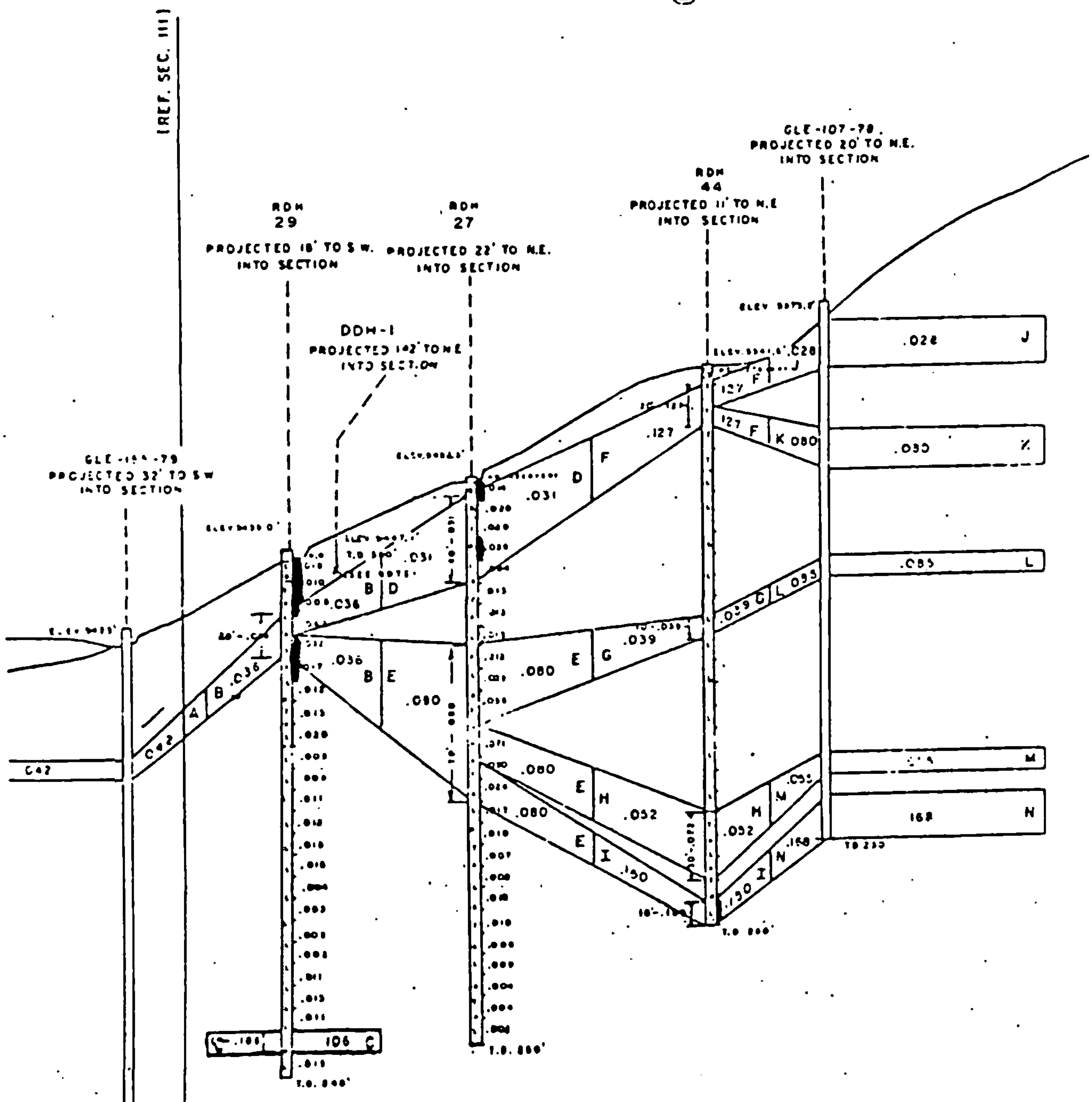
The following orebody cross-sections present the cyanide soluble copper reported in Appendix A and summarized in Figure 3 of the main body of this report.

The color key used in plotting these values is shown below:

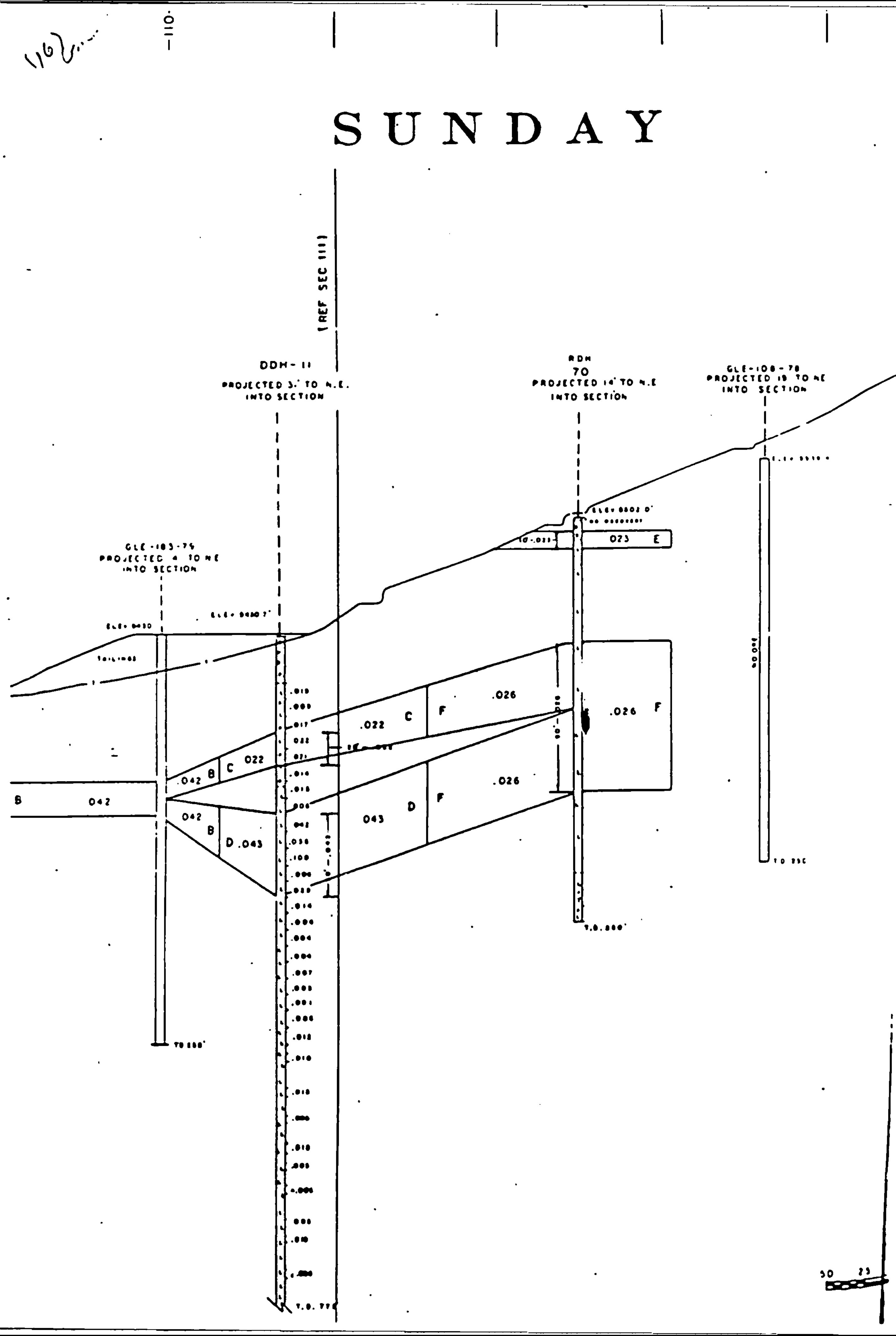
COLOR	CYANIDE SOLUBLE COPPER, ppm
Blue	0 - 10
Yellow	10 - 100
Orange	100 - 1000
Red	> 1000

SUNDAY

SECTION 15



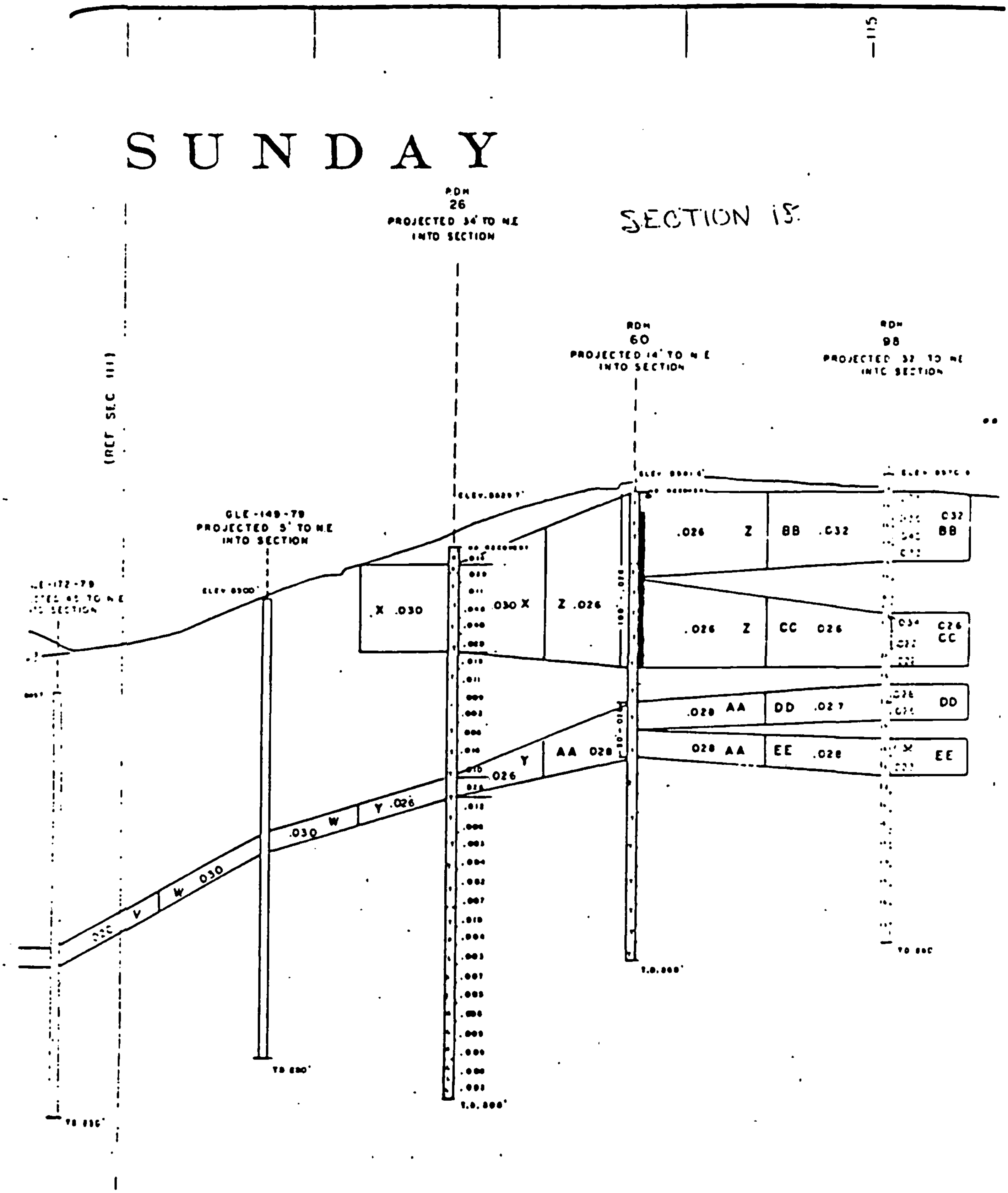
SUNDAY



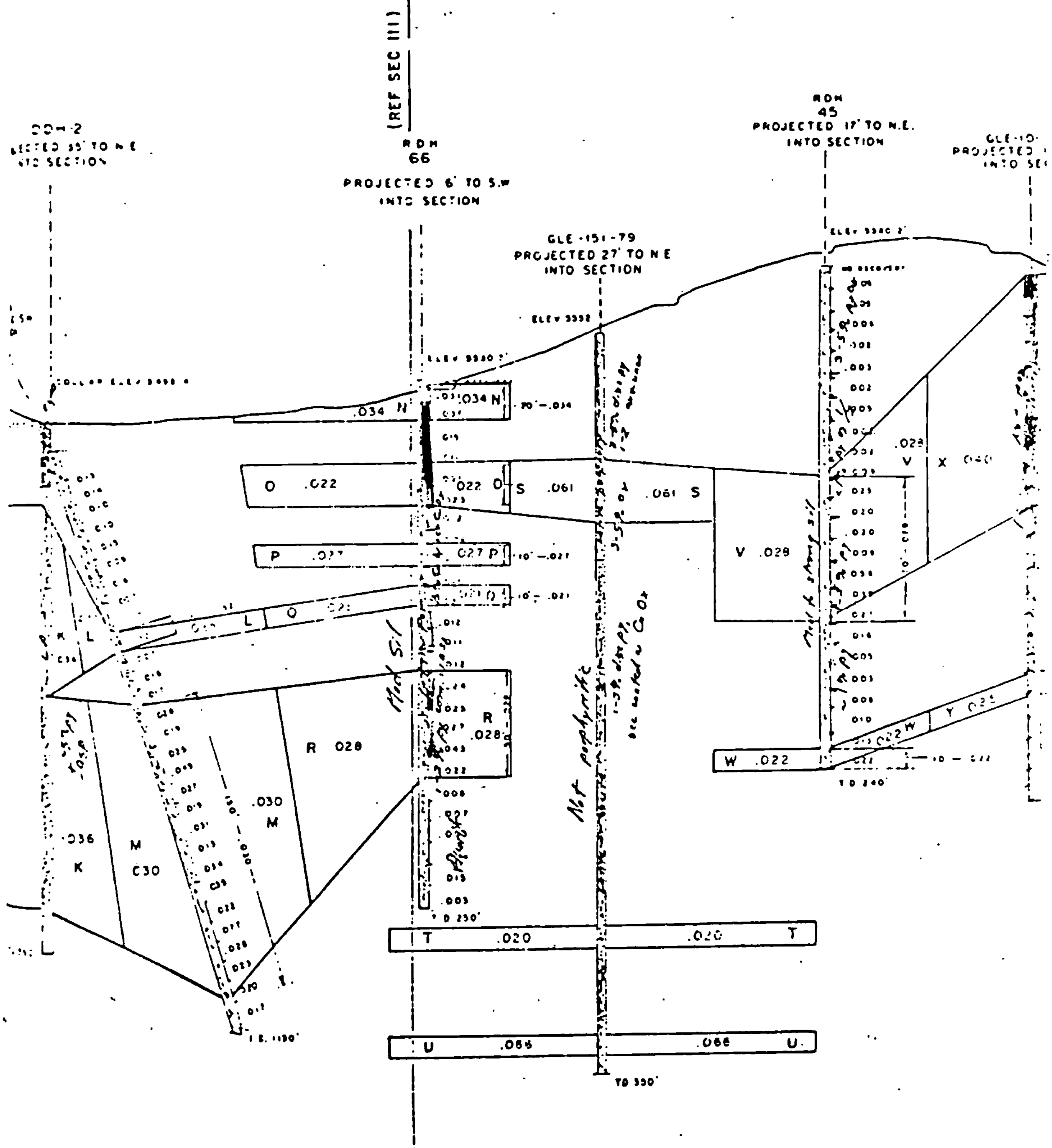
-110-
(REF SEC 111)
DDH-11
PROJECTED 3' TO N.E.
INTO SECTION
RDH
70
PROJECTED 14' TO N.E
INTO SECTION
GLE-108-78
PROJECTED 19 TO NE
INTO SECTION
GLE-183-75
PROJECTED 4 TO NE
INTO SECTION
TAILINGS
.026
.022
C
F
.026
F
022
.042
B
042
.026
043
D
F
042
B
D .043
023
E

SUNDAY

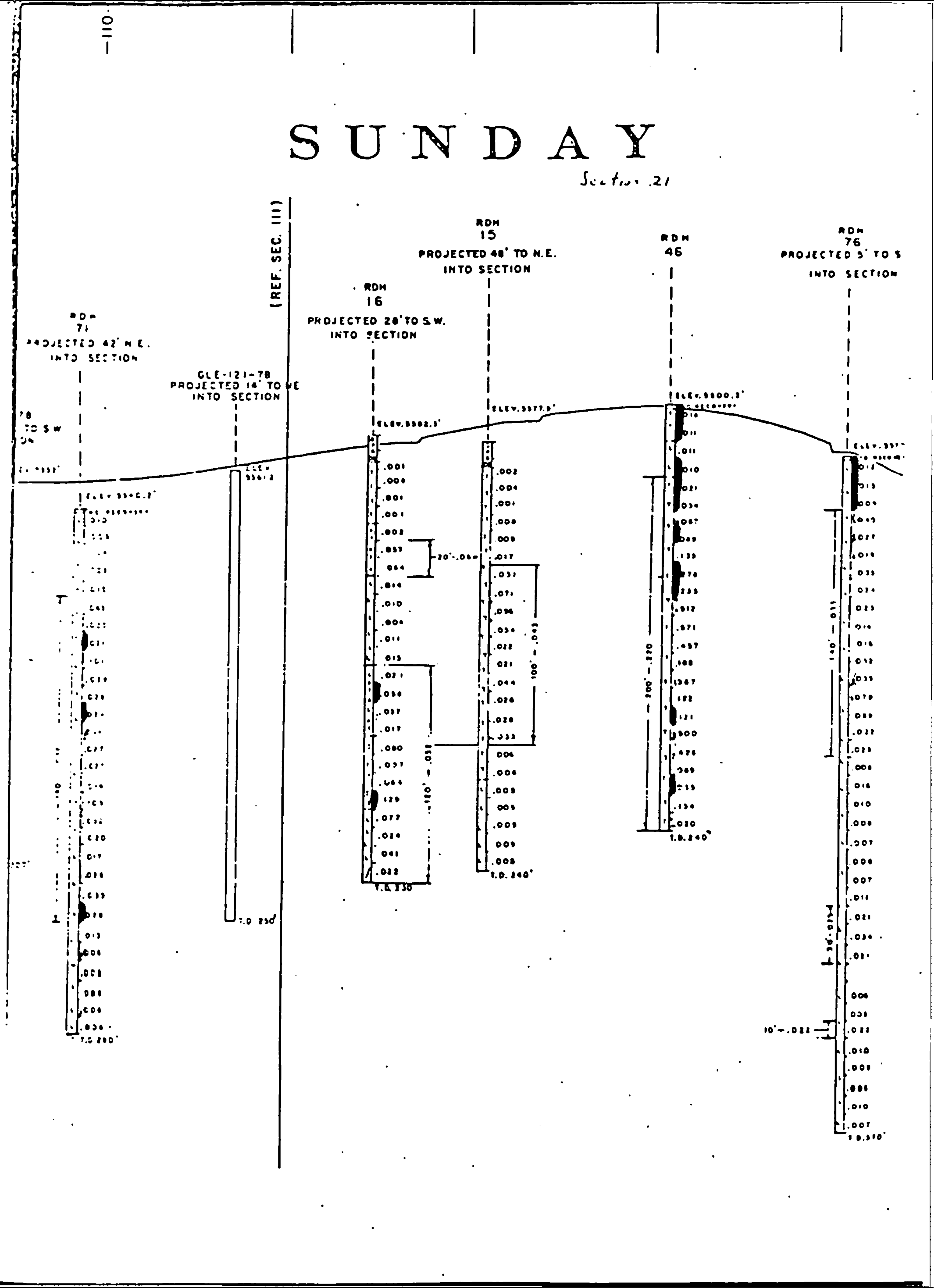
SECTION 15



SUNDAY

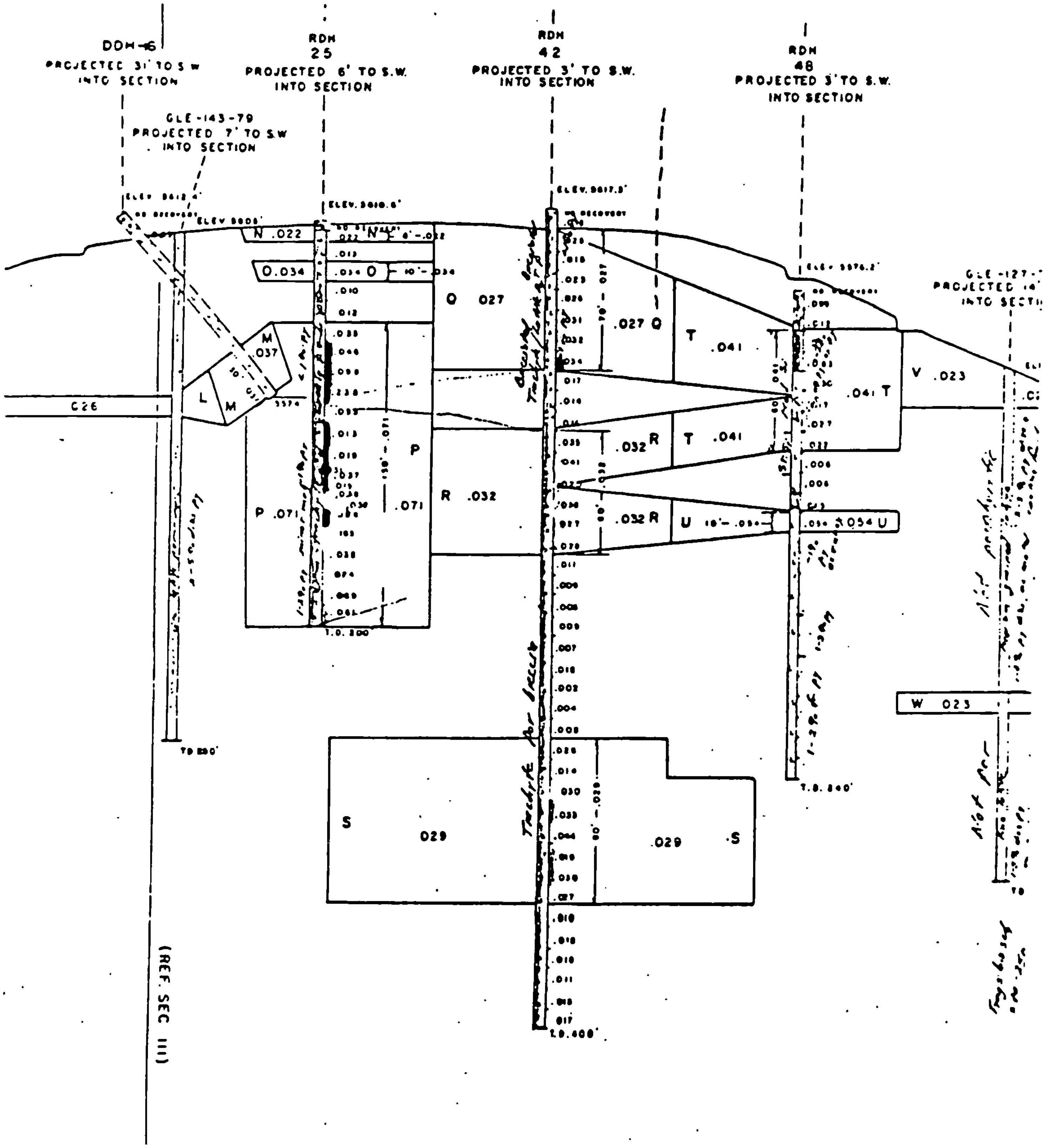


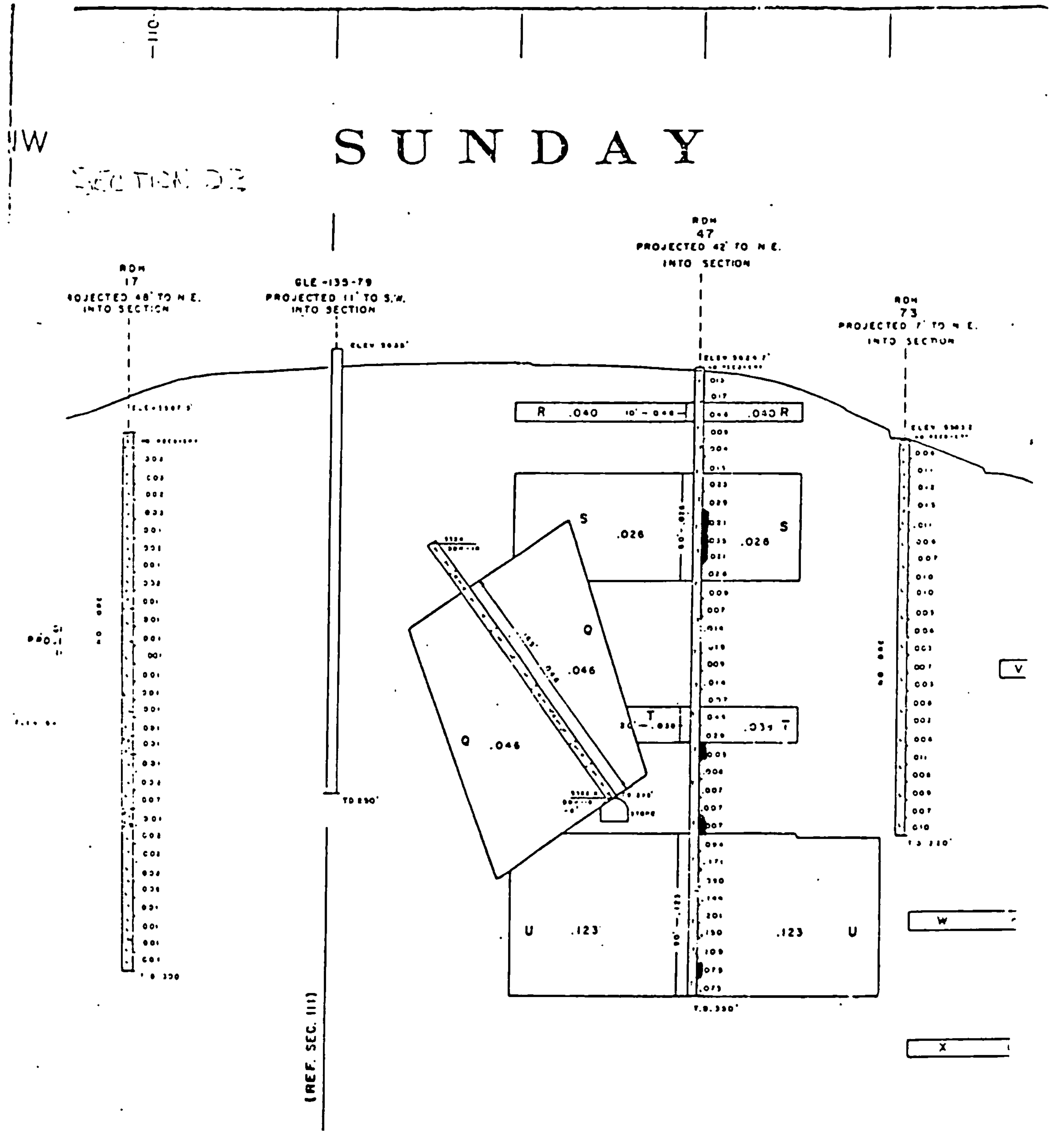
(REF SEC III)
DDH-2
RDH
66
PROJECTED 6' TO S.W
INTO SECTION
RDH
45
PROJECTED 17' TO N.E.
INTO SECTION
GLE-151-79
PROJECTED 27' TO N E
INTO SECTION
ELEV 5552
.034 N
.034 N
O .022
.022 O
S .061
.061 S
V .028
V
X .040
.028
P .027
.027 P
L
O
K
L
R .028
R
.028
.030
M
.036
K
M
C30
T .020
.020 T
U .068
.068 U
W .022
.022 W
Y .023
TD 240'
TD 250'
TD 350'
Not porphyritic

-110-
SUNDAY
Section 21
(REF. SEC. 111)
RDH 71
PROJECTED 42' N.E. INTO SECTION
GLE-121-78
PROJECTED 14' TO NE INTO SECTION
RDH 16
PROJECTED 28' TO S.W. INTO SECTION
RDH 15
PROJECTED 48' TO N.E. INTO SECTION
RDH 46
RDH 76
INTO SECTION
T.D. 250'
T.D. 230
T.D. 240'
T.D. 240'
20'-.064
120'-.032
100'-.043
200'-.280
10'-.032

SUNDAY

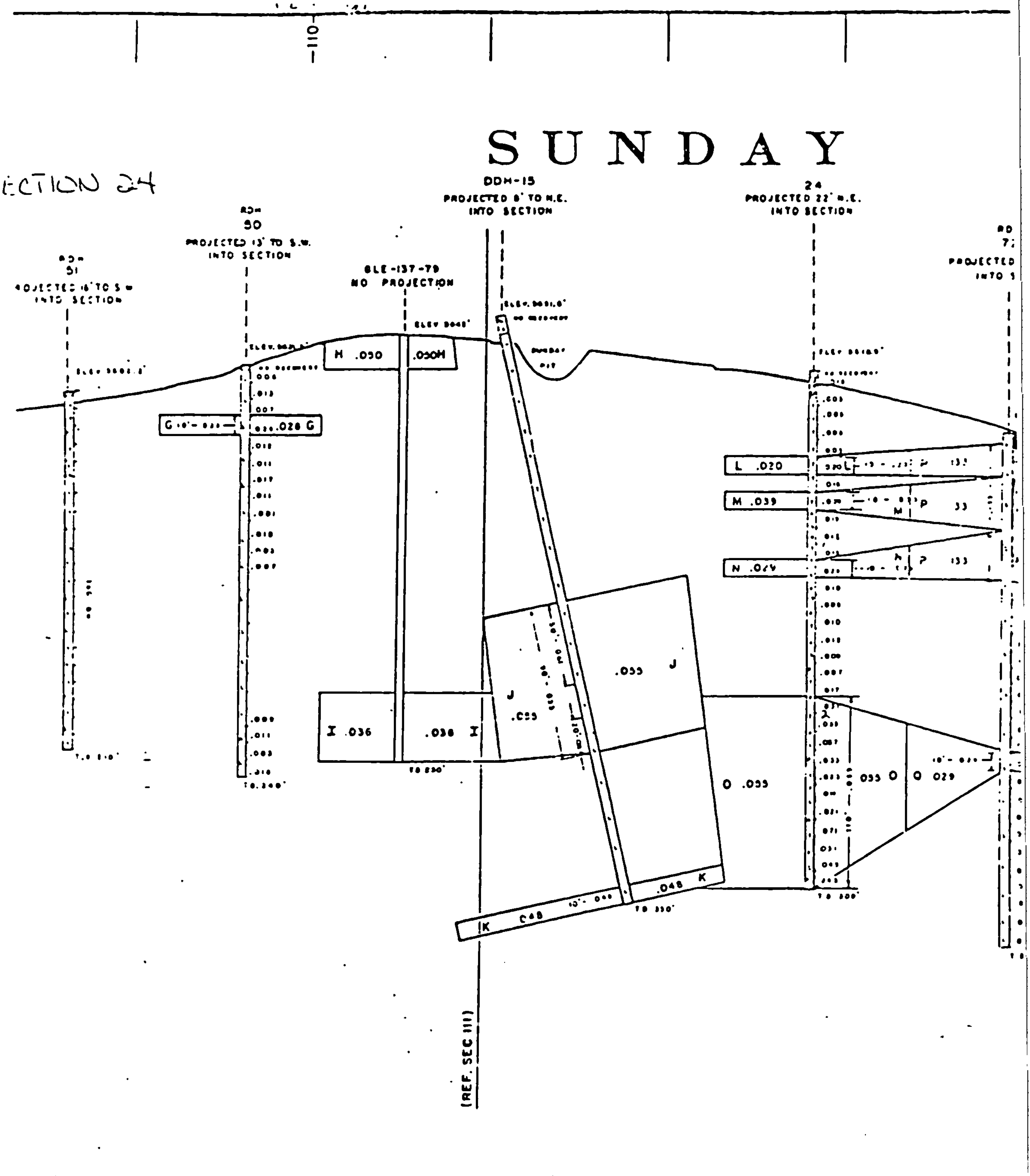
SECTION 22





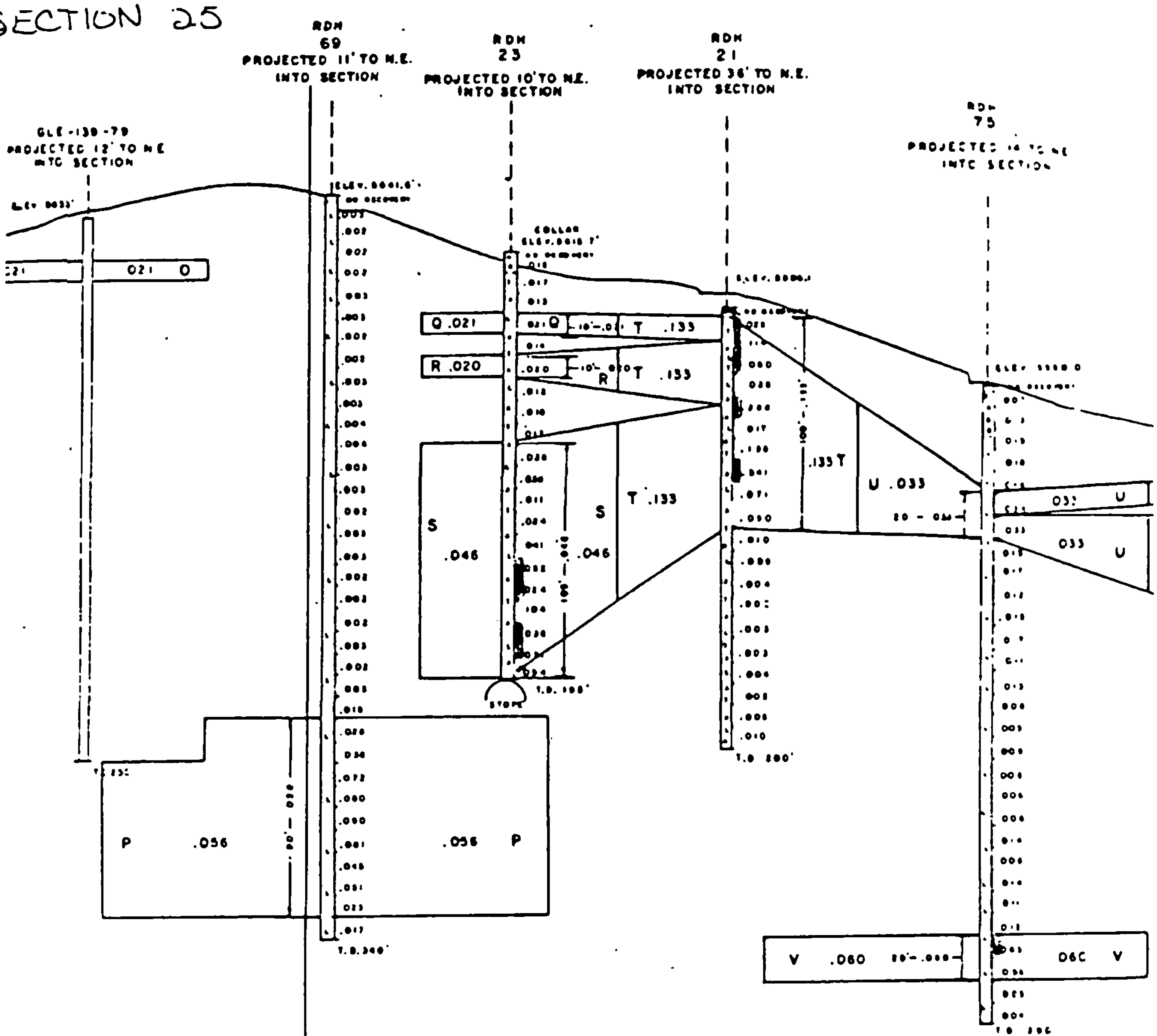
SUNDAY
W
RDH 17 PROJECTED 48' TO N.E. INTO SECTION
GLE-135-79 PROJECTED 11' TO S.W. INTO SECTION
RDH 47 PROJECTED 42' TO N.E. INTO SECTION
RDH 73 PROJECTED 7' TO N.E. INTO SECTION
R .040
.040 R
S .026
.026 S
Q .046
Q .046
T
.034 T
U .123
.123 U
V
W
X
(REF. SEC. III)

SECTION 24

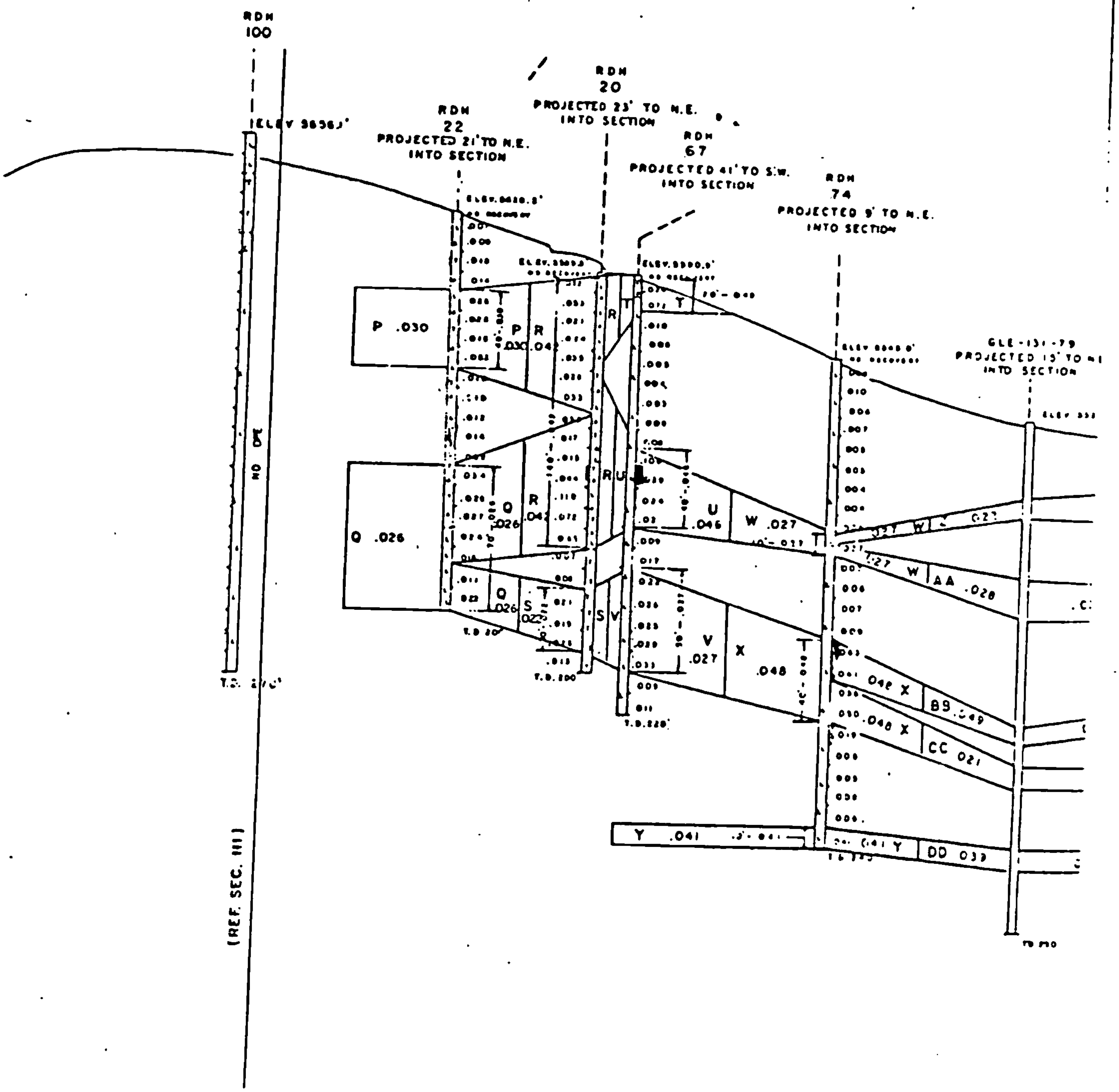

SUNDAY
DDH-15
PROJECTED 8' TO N.E. INTO SECTION
24
PROJECTED 22' N.E. INTO SECTION
RDH 50
PROJECTED 13' TO S.W. INTO SECTION
RDH 51
BLE-137-79
NO PROJECTION
SUNDAY PIT
H .050
.050H
G
.028 G
L .020
M .039
N .029
J
.055
.055 J
I .036
.036 I
O .055
.055 O
O .029
K .048
.048 K
(REF. SEC III)
-110-

SUNDAY

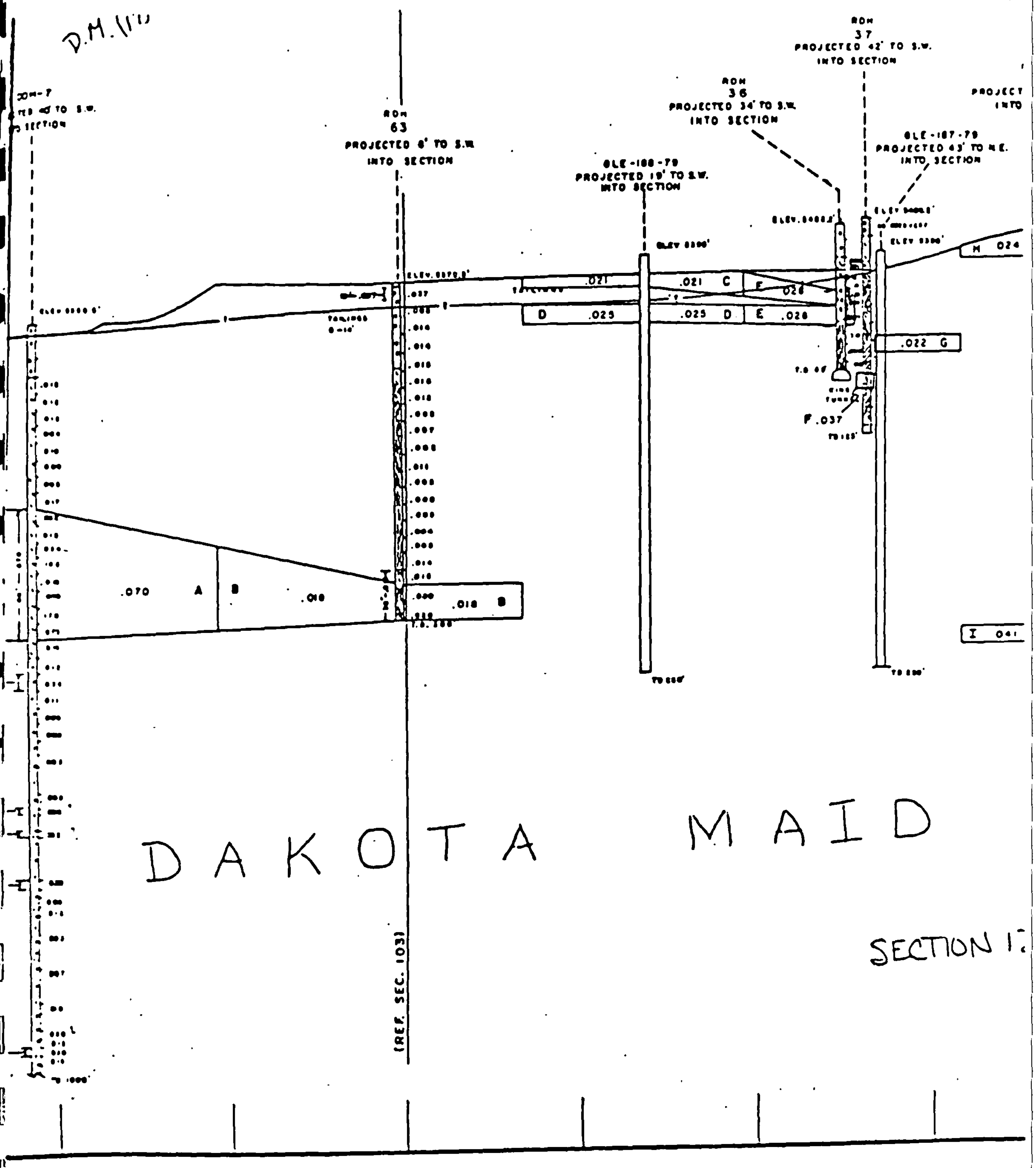
SECTION 25



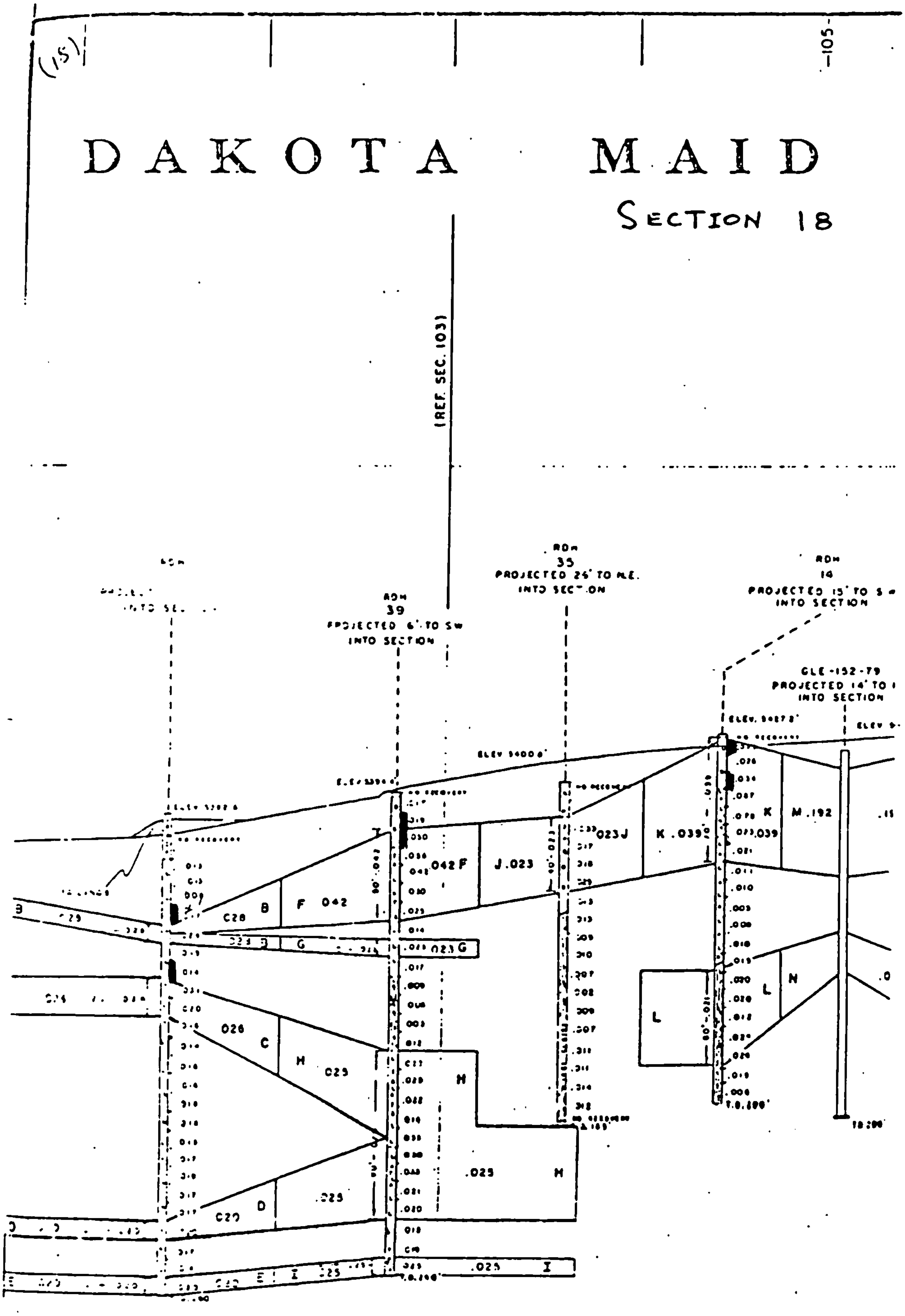
SUNDAY



RDH 100
ELEV 5636.3'
NO ORE
T.D. 270'
(REF. SEC. 111)
RDH 22
PROJECTED 21' TO N.E. INTO SECTION
RDH 20
PROJECTED 23' TO N.E. INTO SECTION
RDH 67
PROJECTED 41' TO S.W. INTO SECTION
RDH 74
PROJECTED 9' TO N.E. INTO SECTION
GLE-131-79
PROJECTED 13' TO N.E. INTO SECTION
P .030
Q .026
Y .041
DD .033
BB .049
CC .021
AA .028

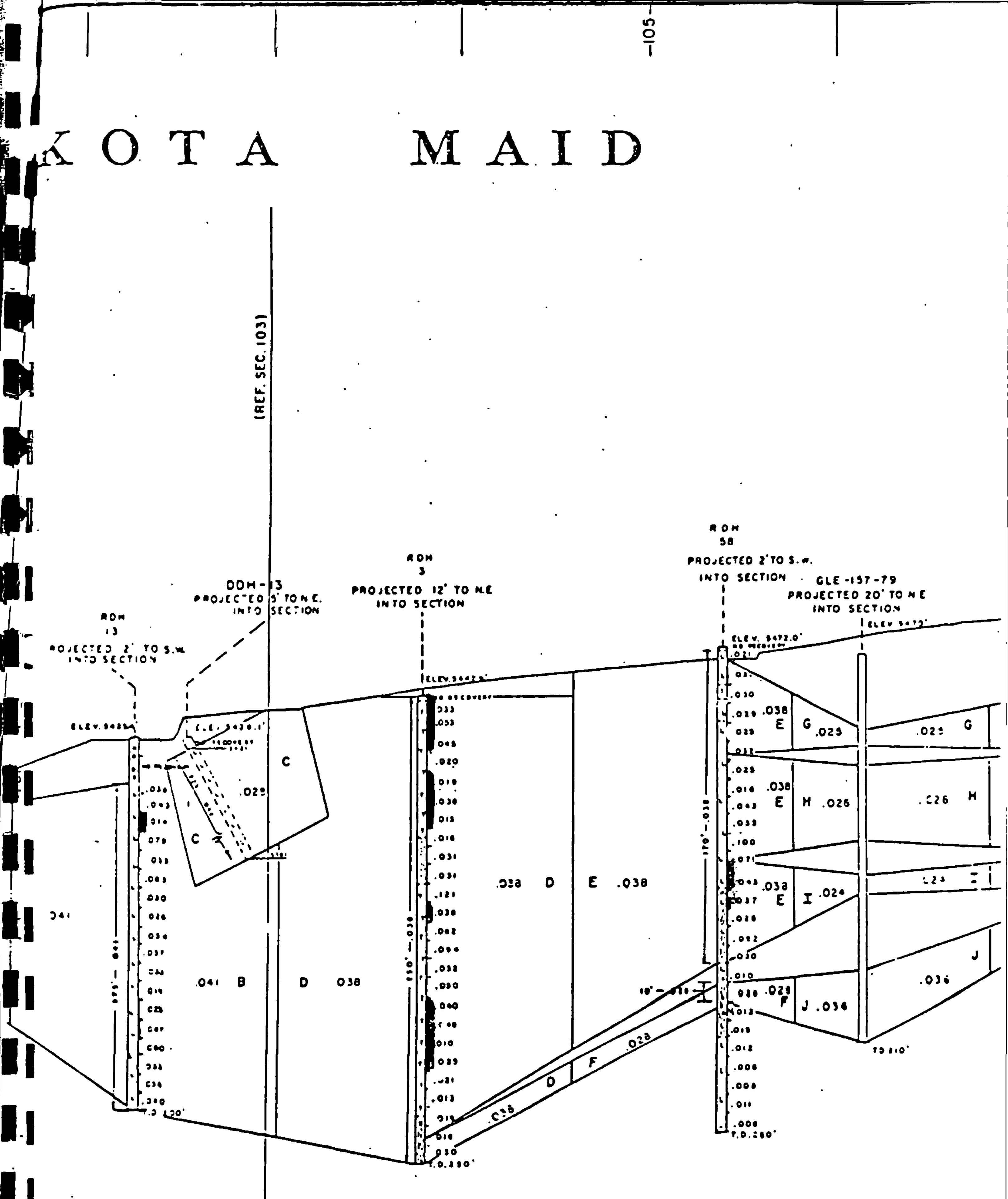


D.M.(1)
RDH 63
PROJECTED 6' TO S.W. INTO SECTION
RDH 36
PROJECTED 34' TO S.W. INTO SECTION
RDH 37
PROJECTED 42' TO S.W. INTO SECTION
OLE-188-79
PROJECTED 19' TO S.W. INTO SECTION
OLE-187-79
PROJECTED 43' TO N.E. INTO SECTION
.021
.021 C
F .028
D .025
.025 D
E .028
H .024
.022 G
F .037
.070 A
B .018
.018 B
I .041
(REF. SEC. 103)
DAKOTA MAID
SECTION 1



(15)
-105-
DAKOTA MAID
SECTION 18
(REF. SEC. 103)
RDH 35 PROJECTED 25' TO N.E. INTO SECTION
RDH 39 PROJECTED 6' TO SW INTO SECTION
RDH 14 PROJECTED 15' TO S.W INTO SECTION
GLE-152-79 PROJECTED 14' TO INTO SECTION
ELEV 5400.0'
NO RECOVERY
T.D. 200'
.042 F
J .023
.023 J
K .039
M .192
.023 G
.025
H
L
N
I

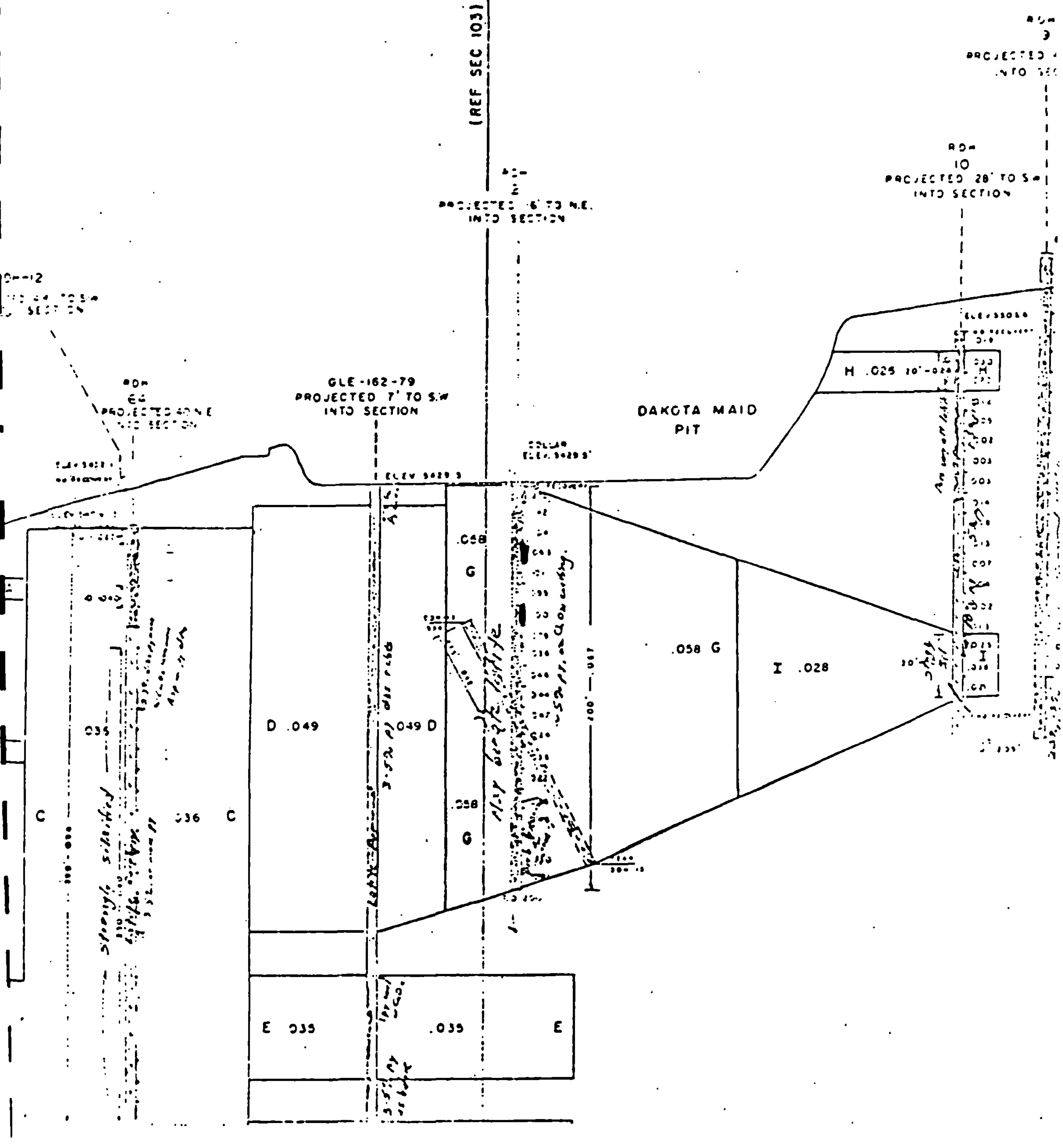
KOTA MAID



-105-
(REF. SEC. 103)
RDH 13
PROJECTED 2' TO S.W. INTO SECTION
DDH-13
PROJECTED 5' TO N.E. INTO SECTION
RDH 3
PROJECTED 12' TO N.E INTO SECTION
RDH 58
PROJECTED 2' TO S.W. INTO SECTION
GLE-157-79
PROJECTED 20' TO N.E INTO SECTION
NO RECOVERY
.041 B
D .038
.038 D
E .038
C
.025
E
G .025
H .026
I .024
J .036
F
.028
T.D. 220'
T.D. 280'
T.D. 260'

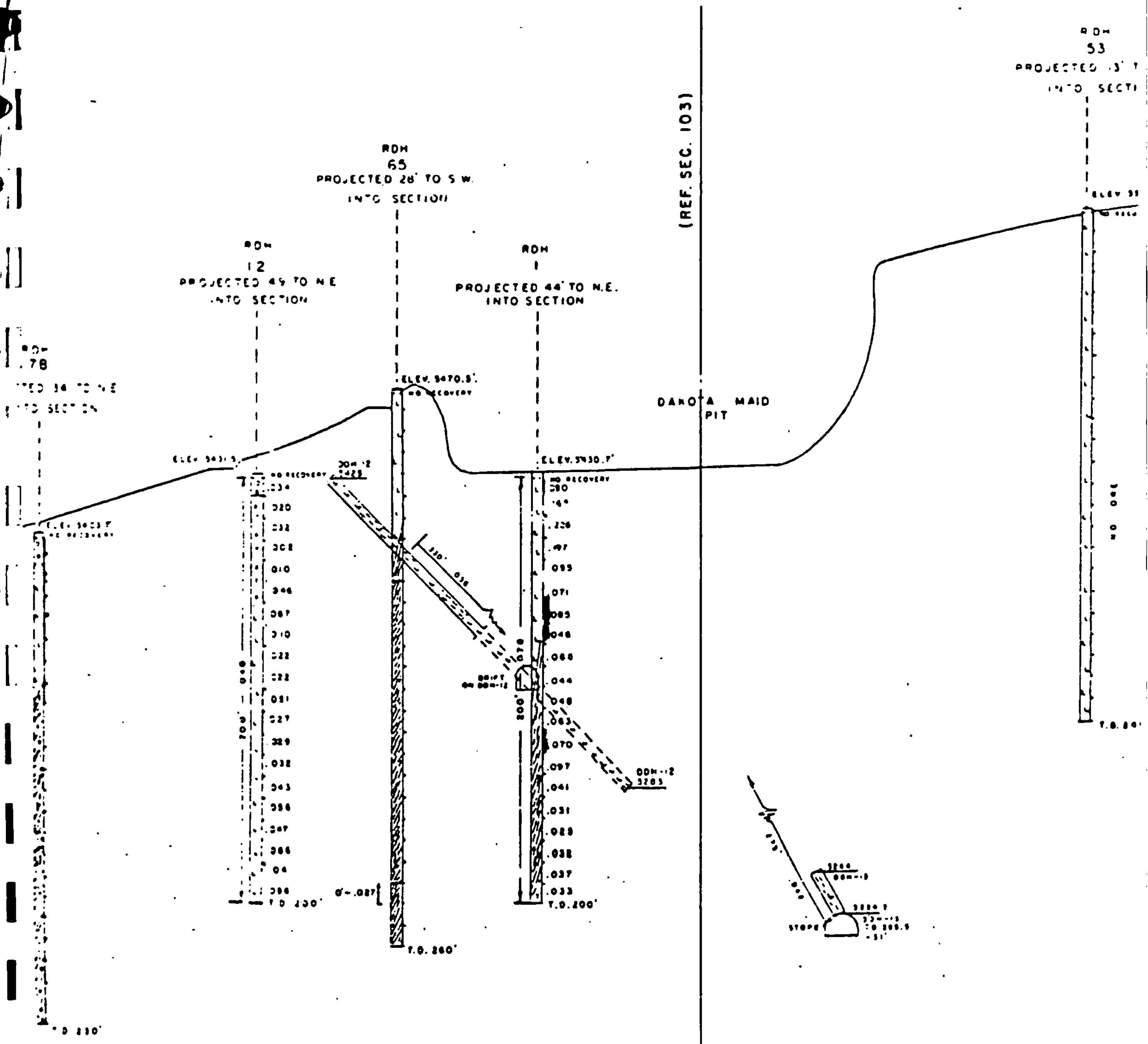
DAKOTA MAID

SECTION 20

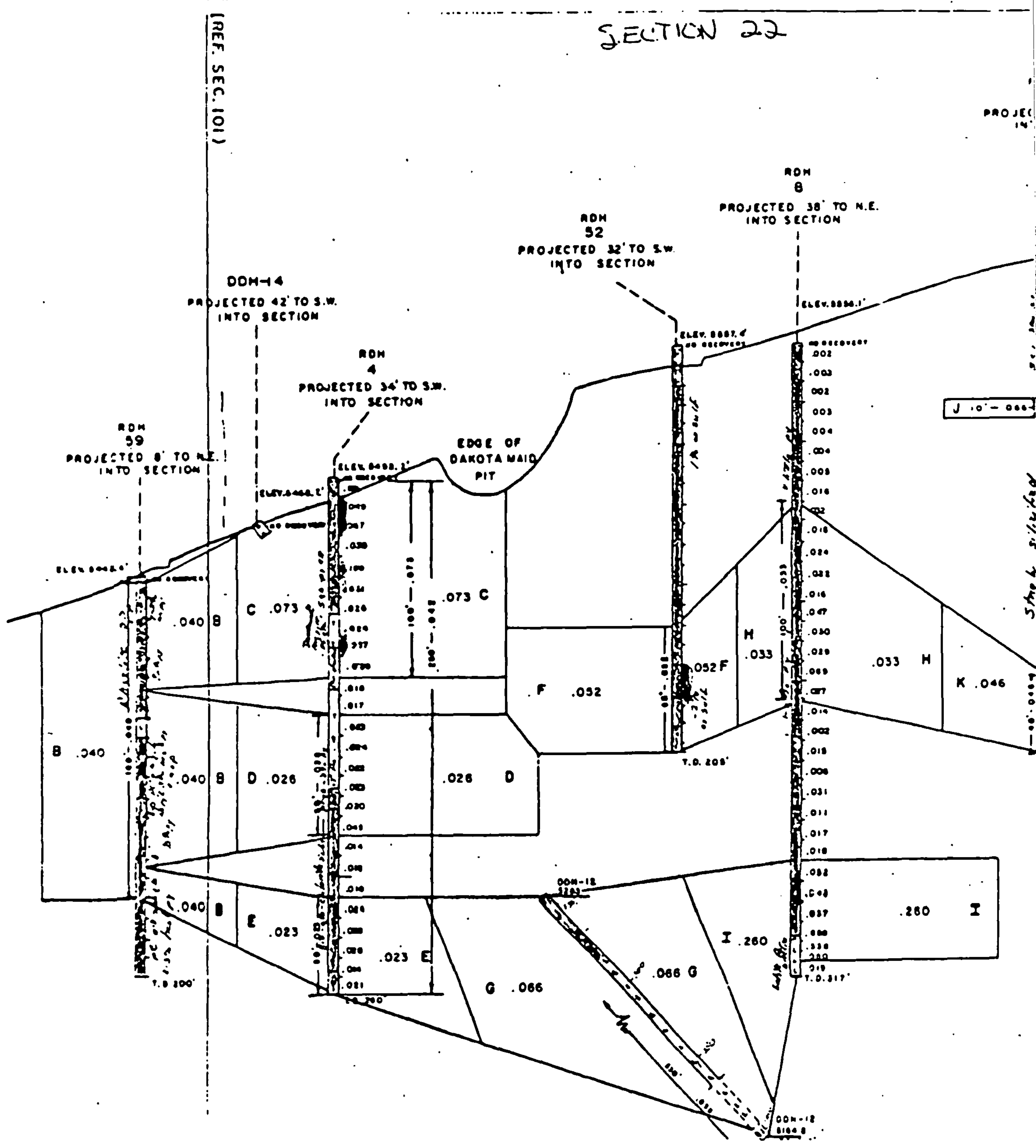


DAKOTA MAID

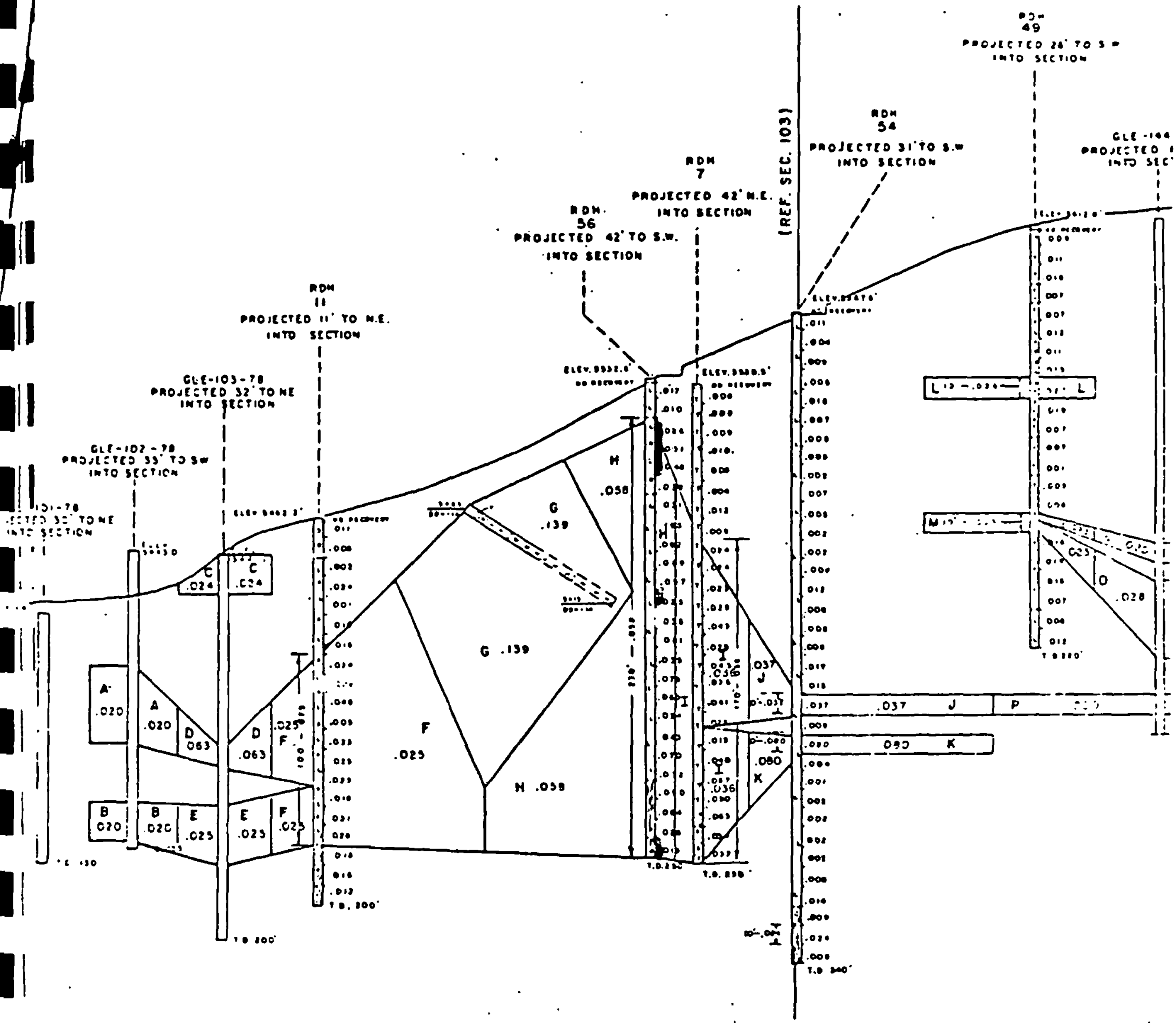
SECTION 21



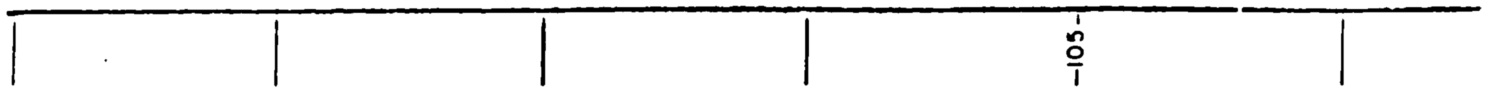
DAKOTA MAID


SECTION 22
(REF. SEC. 101)
RDH 8
PROJECTED 38' TO N.E. INTO SECTION
RDH 52
PROJECTED 32' TO S.W. INTO SECTION
DDH-14
PROJECTED 42' TO S.W. INTO SECTION
RDH 4
PROJECTED 34' TO S.W. INTO SECTION
RDH 59
PROJECTED 8' TO N.E. INTO SECTION
EDGE OF DAKOTA MAID PIT
B .040
C .073
D .026
E .023
F .052
G .066
H .033
I .260
K .046
T.D. 200'
T.D. 205'
T.D. 317'
DDH-12

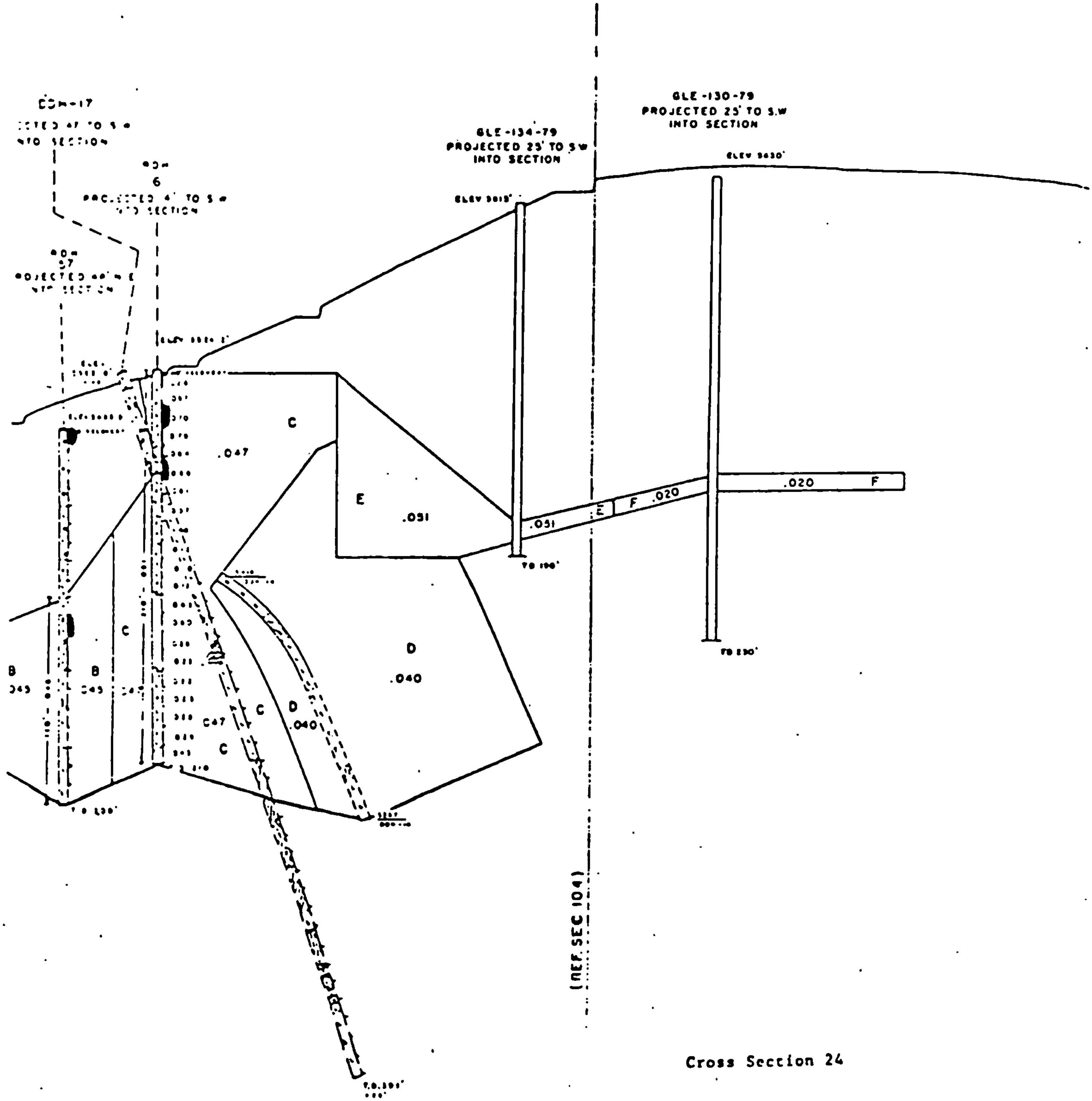
DAKOTA MAID



Block No.	Squa
A	
B	

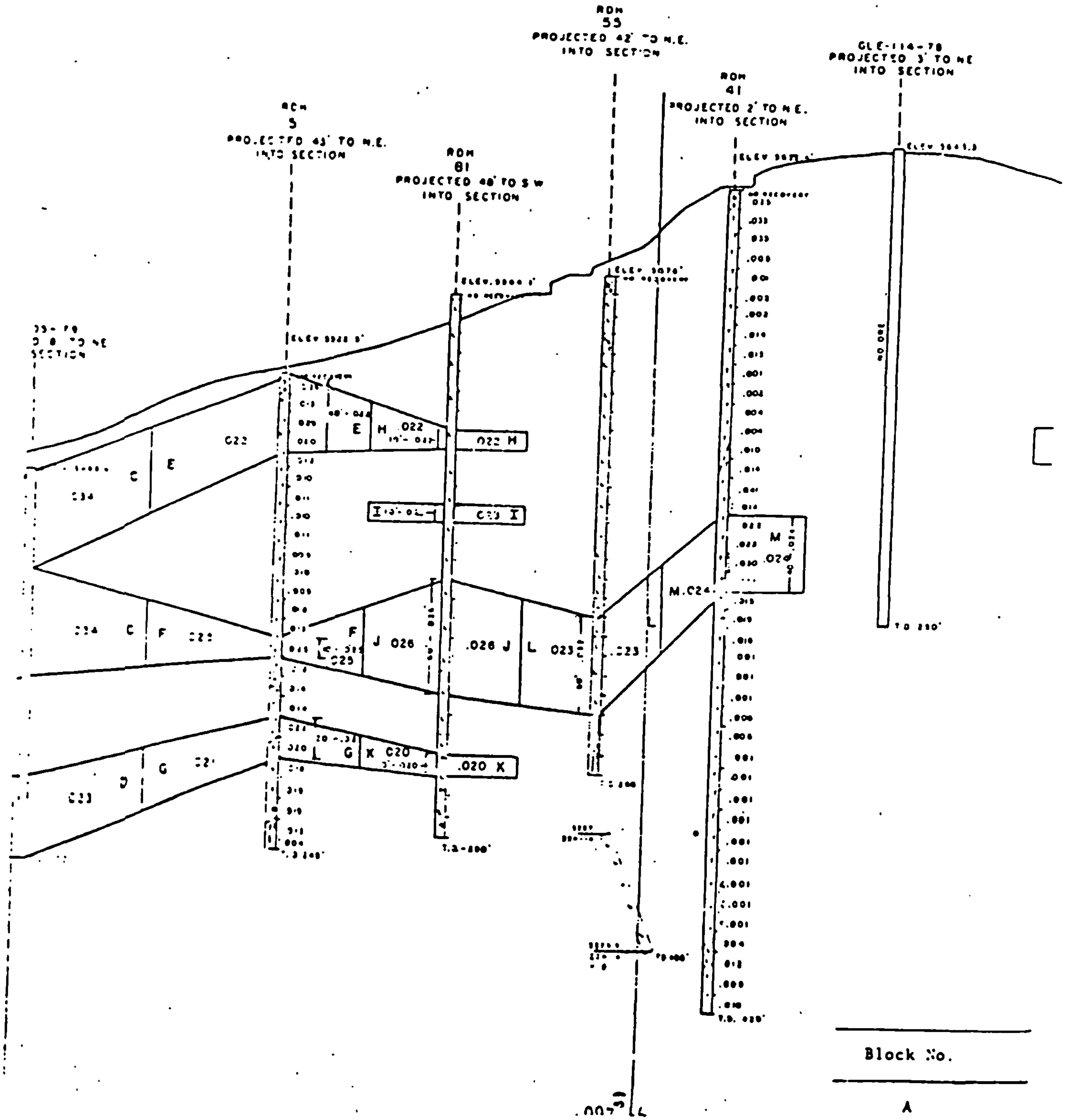


DAKOTA MAID



Cross Section 24

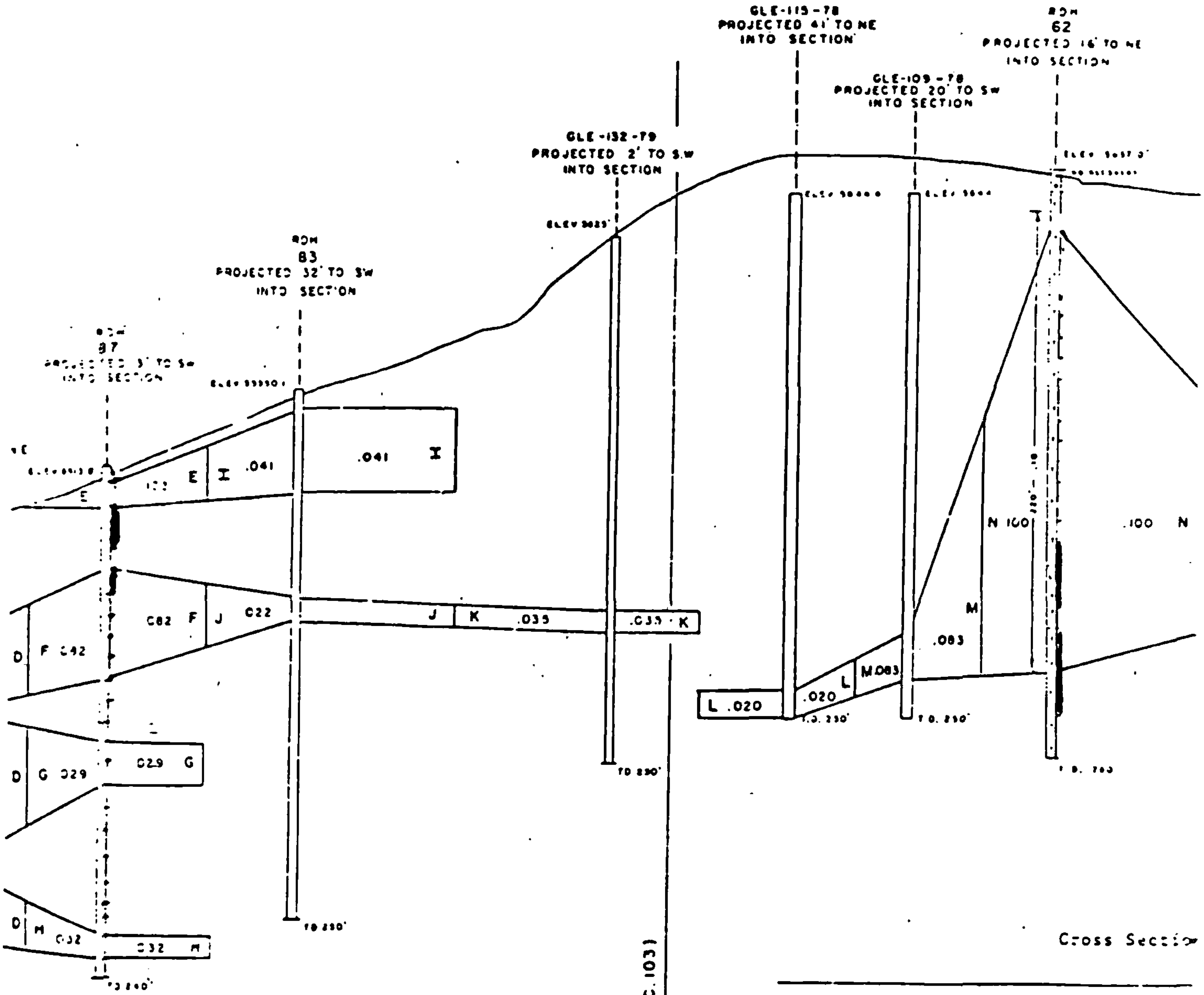
DAKOTA MAID



Block No.

A

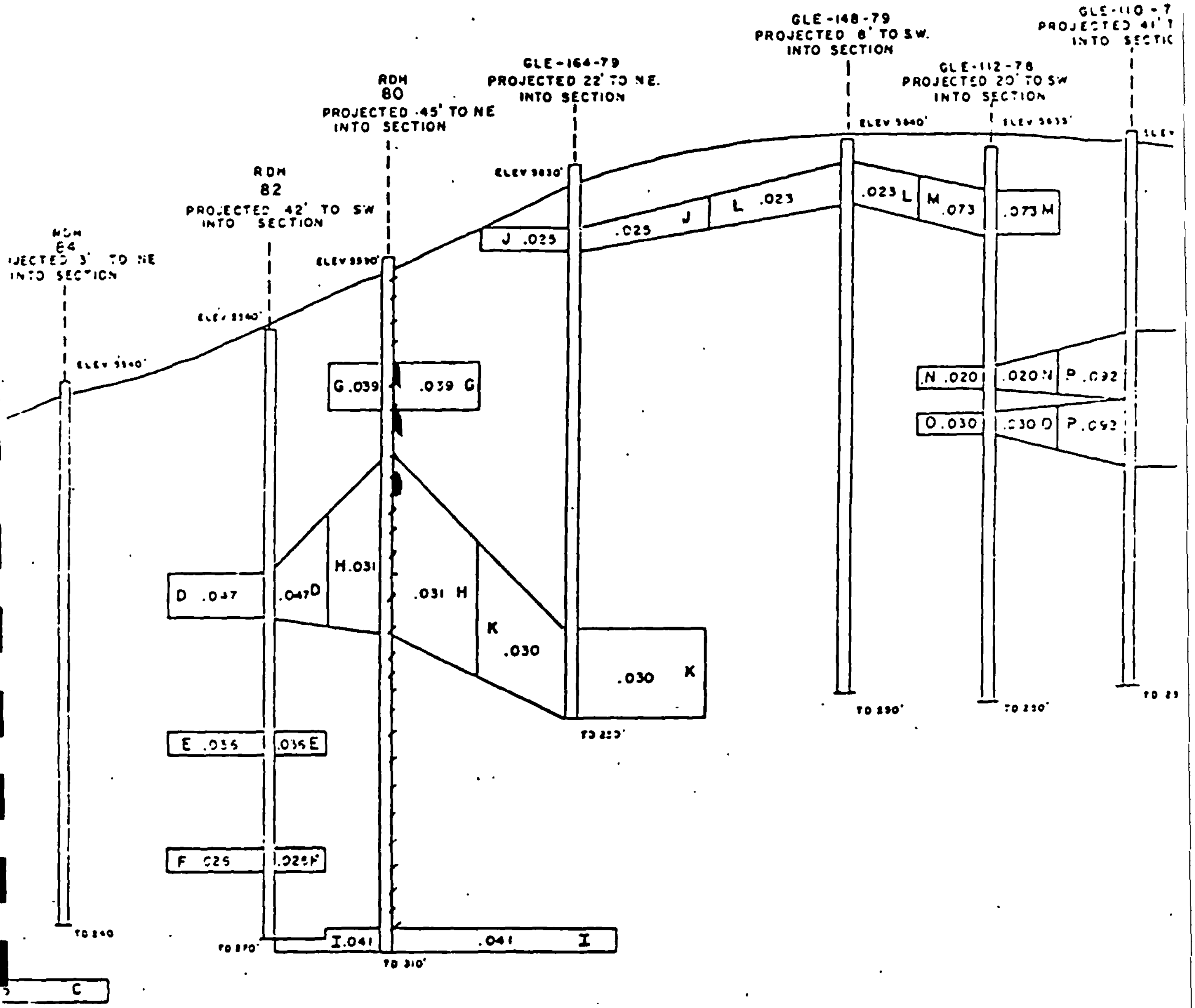
DAKOTA MAID



Cross Sectio

Block No.	Square Inch
A	0.51
B	1.17
C	0.60
D	3.14
E	0.44
F	1.40
G	0.56

DAKOTA MAID



RDH 82
PROJECTED 42' TO SW INTO SECTION
RDH 80
PROJECTED 45' TO NE INTO SECTION
GLE-164-79
PROJECTED 22' TO NE.
INTO SECTION
GLE-148-79
PROJECTED 8' TO SW.
INTO SECTION
GLE-112-78
PROJECTED 20' TO SW
INTO SECTION
J .025
.025 J
L .023
.023 L
M .073
.073 M
G .039
.039 G
N .020
.020 N
P .092
O .030
.030 O
P .092
H .031
.031 H
D .047
.047 D
K .030
.030 K
E .035
.035 E
F .025
.025 F
I .041
.041 I
C
TD 310'
TD 290'

GILT EDGE BUCKET LEACH TESTS
1979 MINI-BULK SAMPLES

by

MILLER-KAPPES COMPANY

November 10, 1981

Miller-Kappes Company

P. O. Box 13687, Reno, Nevada 89507 702-356-7107

1845 Glendale Avenue, Sparks, Nevada 89431

10 November, 1981

FINAL REPORT

GILT EDGE BUCKET LEACH TESTS

1979 MINI-BULK SAMPLES

This report summarizes the results of a testing program on twelve samples of rock taken from the Gilt Edge, South Dakota properties by D. Kappes and M. Cassiday, during September, 1979.

The twelve mini-bulk samples were taken, using a hammer and moil to chip rock form the surface of the existing mine workings, from areas where one-ton bulk samples were not feasible. Each sample weighed 150 to 200 pounds, Seven of these samples were taken on the R-2 level of the Sunday shaft, 155 feet below the Rattlesnake level at elevation 5350, and represent ore in a deep, damp zone of mixed oxide/sulfide ore with some secondary copper enrichment. Two samples were taken from the walls of the Dakota Maid pit and represent near-surface sulfide ores. Three samples were taken in existing prospect drifts into the extreme north end of the Dakota Maid Zone in areas beyond the prime ore target zones. A set of maps included in this report show the sample locations.

Figure 1 presents sample descriptions and a summary of bucket leach test results. The four pyrite-containing unoxidized samples, 773H-K, averaged 52 percent recovery of contained gold. One of these, K, was from the deep-level Rattlesnake area and contained secondary chalcocite and green copper staining. Two of these, H and I, were highly pyritic Dakota Maid pit samples. The six deep-level Rattlesnake Zone oxidized samples, 773A, B, D-G, averaged 69 percent gold recovery (sample A was actually unoxidized but contained only pyrite).

Three samples, 773 C, I, and L, were taken from the extreme north end of of the Dakota Maid Zone. C and I both achieved 48 percent recovery (head grades were low), while L achieved 84 percent.

The overall conclusions from this series of tests are: 1) that the deep-level Rattlesnake ores, which were taken from a damp, salt-rich, copper-enriched area 50 feet above the present water table, will average about the same recoveries (71 percent) as the nearer-surface ores previously tested; and 2) that highly pyritic, Dakota Maid ores will yield recoveries in the range of about 51 percent, which also correlates with testing of similar ores from the King Tunnel; and 3) that north-end ore probably leaches similar to the ore in the major ore centers. The only major discrepancy noted in the present series of tests is the 60 percent recovery now achieved on sample 773H from the Dakota Maid pit, as compared with a recovery of 30 percent from a previous, identical sample.

Figure 2 presents a bar chart showing head grade and percent recoveries for all the samples.

SCOPE OF THE TESTING PROGRAM

The following tests were run on each of the samples:

1. Fire assays on separate size fractions of head samples.
2. Centrifuge tube cyanide leach tests on pulverized portions of the head samples.
3. Bucket leach tests on rock crushed to 5/8-inches.
4. Fire assays on separate size fractions of the bucket test tails.

SAMPLE PREPARATION

The as-received samples were dry or only slightly damp, and were processed without further drying. Weighing approximately 70 Kg each, the samples were typical rock chip samples with some fines and coarse fragments up to six inches maximum dimension.

Each of the samples, delivered to the lab in 2 - 4 large paper sacks were dumped onto a 5 foot x 5 foot piece of hypalon, the large pieces broken by hand to 3-inches or less, and mixed well. Using a small scoop, the material was split into two or three, approximately identical, 5-gallon portions, all but one of which were stored for future testing.

One 5-gallon portion from each sample was crushed in a jaw crusher to 5/8-inch. A head sample of approximately 6 Kg was split out from the 5/8-inch material using a Jones splitter, and the remainder of each sample was placed in a leach column.

The 6 Kg head sample was screened into various size fractions and weighed. Each of these size fractions was further crushed through a set of rolls, if necessary, to minus 6 mesh; then a 500 gram portion was split out and pulverized. The pulverized samples were used for a series of cyanide centrifuge tube tests and also for fire assays.

FIGURE 1. SAMPLE DESCRIPTIONS AND

BUCKET LEACH TEST RECOVERIES

SAMPLE NO.	LOCATION	DESCRIPTION	CN-SOLUBLE COPPER (ppm)	GOLD CONTENT/% RECOVERY (oz per ton/%)
773 A	Rattlesnake R-2 level. wide belled-out area in east drift	unoxidized, minor pyrite and chalcopyrite (less than 1%) color, pink-white. Moderately soft rock, apparent clay alteration of feldspars.	764	.056/69.79
773 B	same as 773 A	oxidized, otherwise same rock as 773 A. Considerable introduced hematitic staining. Color, 70% of rock fragments, pink-white, 30%, brick red.	50	.061/70.36
773 C	North end Dakota Maid Zone, "C" Adit, face of right hand cross-cut	oxidized, minor very tiny pyrite casts. Color, 70% of pieces brownish-white, 30% chocolate brown. Moderately hard rock, some apparent silicification, apparent clay alteration of feldspars.	1	.020/50.14
773 D	Rattlesnake R-2 level, from walls of caved stope at north end of east drift	oxidized, minor tinv pyrite casts (2%). Color of fragments, pink-white to medium pink. Moderately hard rock, apparent clay alteration of feldspars.	8	.034/79.65
773 E	Rattlesnake R-2 level, from walls of short drift into west wall of timbered stope in west drift (same stope area as 773 D, sample location about 75 ft from 773 D)	oxidized, no pyrite casts. Color, pink-white. Moderately hard rock, very little apparent clay alteration.	14	.016/49.24
773 F	Rattlesnake R-2 level, from walls of shaft station immediately east of shaft	oxidized and heavily acid-leached. About 3% pyrite casts. Color, uniform medium red-grey. Soft, vuggy rock.	5	.030/69.84
773 G	Rattlesnake R-2 level, from four corners of east drift intersection with shaft cross-cut (approx. 30 feet southeast from location of 773 E)	sample descricption identical to 773 D	3	.031/74.22
773 H	Dakota Maid Pit, northeast undercut, 150 feet along wall same location as previous sample DM-5 (see 1979 report, gold recovery from DM-5 29%, head assay 0.165 oz/ton)	mixed, approximately 15% unoxidized light-pink, hard, 5% pyrite, little clay alteration; 85% oxidized, brown-yellow and dark red, moderately hard with 5% pyrite casts.	131	.192/60.0
773 I	North end of property, Nevada Tunnel (Adit B), about half-way along tunnel, near Cyprus original sample location 8	unoxidized, 5% pyrite. Color of fragments 80% ivory, 20% brown, (oxidized fracture fillings). Moderately hard rock, apparent clay alteration of feldspars and probably some silicification.	16	.011/46.11
773 J	Dakota Maid Pit, sulfide zone in south undercut	unoxidized, approximately 30% grey quartzite, 60% moderate hard white volcanics with yellow fracture staining and 5% dissem pyrite, 10% vuggy agglomerates of pyrite crystals (apparently fracture fillings).	8	.091/47.16
773 K	Rattlesnake R-2 level, three-chute stope	unoxidized, 2% pyrite., 1% chalcocite on fractures (not coating pyrite). Hard rock, color light grey with light yellow fracture staining, some green copper staining.	1,188	.072/53.91
773 L	North end of property, Nevada Tunnel (Adit B), walls and back of tunnel near face	mixed oxidized/unoxidized, with minor pyrite	4	.033/84.89

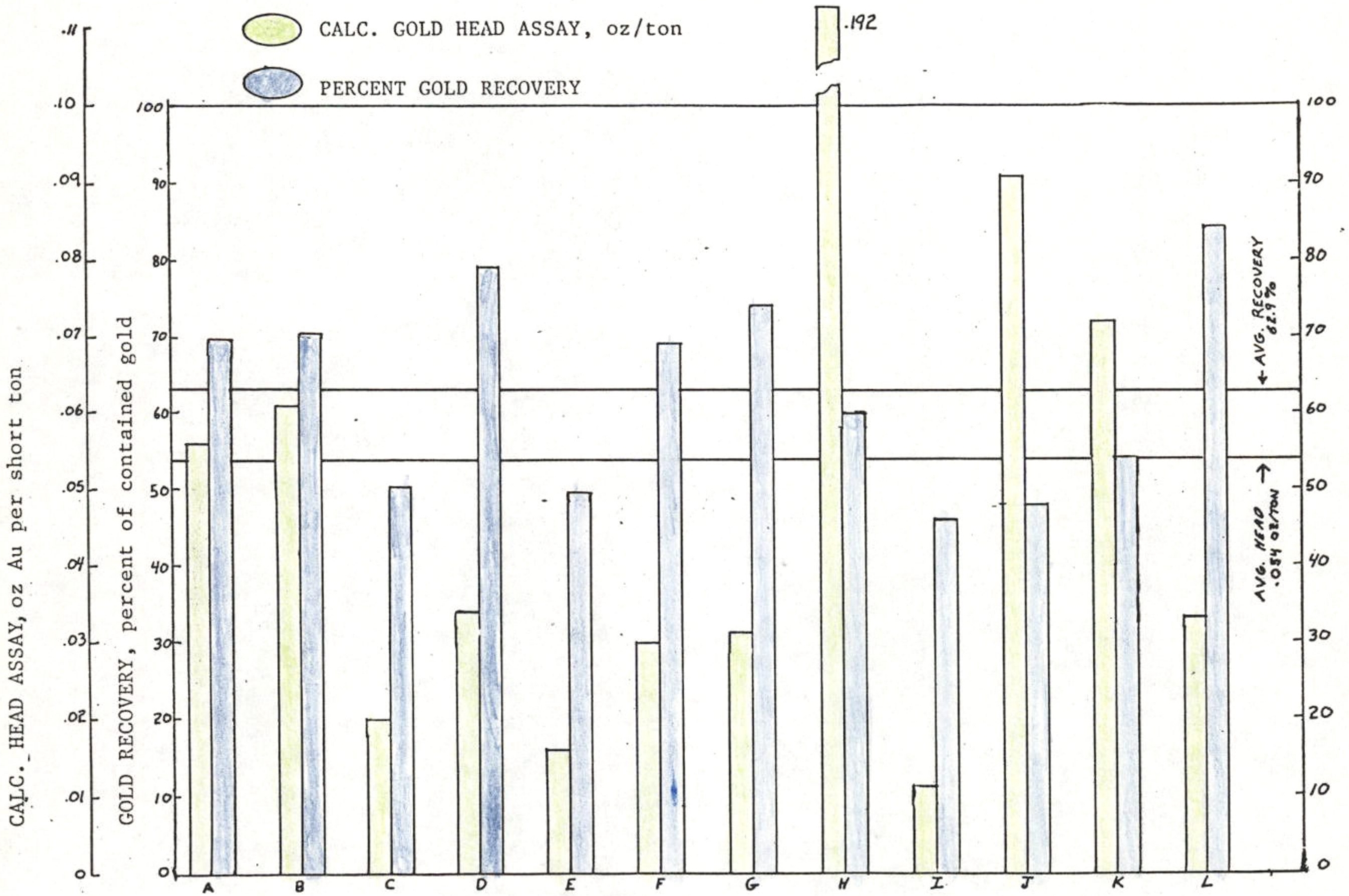


FIGURE 2. GILT EDGE MINI-BULK SAMPLES
12 BUCKET LEACH TESTS ON -5/8" ORE
ORE GOLD CONTENT AND GOLD RECOVERY STATISTICS

CENTRIFUGE TESTS ON HEAD SAMPLES: GOLD DISTRIBUTION IN HEAD SAMPLES

The pulverized pulps from the various screen sizes of the head samples were subjected to cyanide centrifuge tube tests, according to the following procedure:

1. Weigh out 10 grams of pulverized ore and place in centrifuge tube.
2. Add 25 mls of 5 gpl NaCN solution. Adjust pH, if necessary, to pH 10, using lime.
3. Place on wrist-action shaker for 24-hours.
4. Centrifuge and filter through glass wool.
5. Check solution for pH, Au and Ag. Discard residue.

Figure 3 shows head assays of the pulps (fire assays), the percent recovery of contained gold in a 24-hour cyanide centrifuge tube test on pulverized material, and the product fineness (ratio of gold to gold plus silver, times 1000). There are large variations in the reported percent recoveries, probably due to the presence of coarse gold in the samples.

Gold distribution by size fraction is also shown in Figure 3 for each of the 12 samples, and the average distribution for all the samples is shown in the table below. Dakota Maid and Sunday Zone samples were combined in calculating the average distribution, as there appeared to be no significant difference between them.

SIZE FRACTION	WEIGHT PERCENT OF TOTAL SAMPLE IN FRACTION	GOLD oz/ton	PERCENT OF TOTAL GOLD IN SIZE FRACTION
+ 3 mesh	59.5	0.063	63.0
- 3 + 65 mesh	36.4	0.040	24.5
-65 +150 mesh	1.7	0.133	3.7
- 150 mesh	2.4	0.214	8.8

The data clearly indicates that the gold is concentrated into the smaller size fractions, which is an indicator that it occurs primarily on fracture surfaces within the rock.

FIGURE 3. AGITATED CYANIDE LEACH TESTS

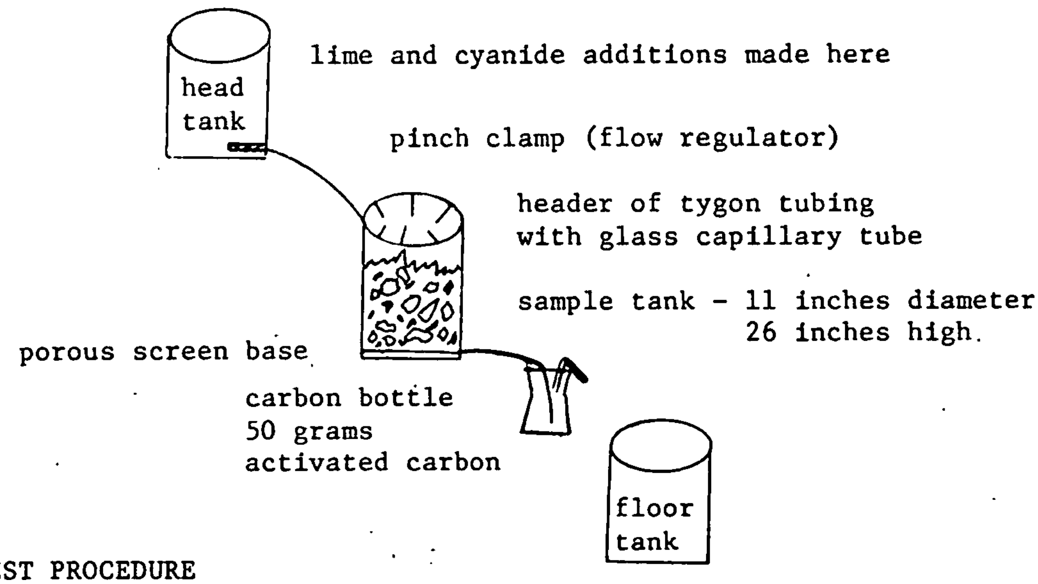
ON PULVERIZED PORTIONS OF SAMPLE SIZE FRACTIONS

(oz gold per ton/percent gold recovery/gold fineness)

SAMPLE NO.	BUCKET TEST NO.	+3 mesh	-3 + 65 mesh	- 65 + 150 mesh	- 150 mesh	WEIGHTED AVERAGE
773 A	774	.072/ 81.9%/655	.042/ 66.7%/583	.062/270.9%/423	.540/107.6%/645	.072/ 86.1%/625
773 B	775	.040/ 70.0%/549	.044/120.4%/726	.078/102.6%/800	.118/111.0%/704	.044/ 90.9%/621
773 C	776	.012/ 75.0%/ 25	.010/240.0%/118	.032/115.6%/ 62	.078/ 98.7%/ 61	.013/130.8%/ 58
773 D	777	.016/ 93.7%/577	.018/161.1%/744	.088/143.2%/863	.212/106.6%/834	.023/117.4%/649
773 E	778	.003/400.0%/571 (tr)	.003/266.7%/444 (tr)	.054/ 85.2%/807	.062/103.2%/780	.005/240.0%/534
773 F	779	.028/110.7%/663	.016/150.0%/706	.068/ 73.5%/833	.122/104.1%/830	.027/114.8%/685
773 G	780	.016/ 93.7%/349	.012/133.3%/348	.066/ 57.6%/731	.106/ 74.5%/687	.018/ 94.4%/363
773 H	781	.120/ 90.8%/122	.160/ 98.1%/194	.430/ 62.3%/221	.530/ 87.4%/177	.150/ 92.0%/151
773 I	782	.012/ 75.0%/ 54	.032/ 37.5%/ 57	.036/ 72.2%/ 43	.046/ 84.8%/ 33	.021/ 52.4%/ 54
773 J	783	.068/ 67.6%/267	.074/ 55.4%/194	.352/ 81.2%/286	.524/ 66.4%/177	.082/ 67.1%/238
773 K	784	.332/ 82.7%/846	.082/ 70.7%/659	.244/ 82.8%/811	.152/ 52.6%/559	.235/ 80.8%/770
773 L	785	.016/150.0%/480	.024/120.8%/491	.076/165.8%/829	.130/109.2%/721	.023/130.4%/496
AVERAGE		.061/ 86.3%/430	.043/ 92.6%/439	.132/ 91.6%/551	.218/ 90.0%/517	.059/ 88.1%/437

BUCKET LEACH TEST APPARATUS

The apparatus for the 5/8-inch rock tests is shown in the drawing below.



LEACH TEST PROCEDURE

In the apparatus shown above, the center tank or leach tank, was filled with the rock to be leached.

Alkaline cyanide solution was continuously distributed onto the rock from the head tank through a set of glass capillary drip tubes. Flowrate of solution dripping onto the rock was controlled using a pinch clamp, to approximately 12,000 ml per 24 hours, or 0.0035 gpm per square foot of heap top surface.

Solutions entering the floor tank were assayed periodically (initially every two days, averaging once/10 days over the life of the tests) for cyanide and lime, and reagents added as necessary to maintain solutions at "target" levels.

Solutions exiting the leach tank flowed continuously through a bottle of activated carbon and then into a floor tank. The 12,000 ml of active solution in the system was recycled to the head tank every 48 to 72 hours, so that the average flowrate over the life of the tests was 0.0015 gpm per square foot of heap top surface.

The tanks were kept covered at all times to minimize evaporation and cyanide loss. No makeup water was required.

The charge of activated carbon was removed three times during the tests and assayed to determine the amount of gold and silver leached from the ore. Carbon changes were made on days 10, 24 and at the end of the tests on day 107 (11 tests) or 281 (1 test on sample 773K). Of the 12 tests begun in April, 1980, 11 were ended in July, 1980. The test on sample 773K was ended in January, 1981 after the fourth carbon was removed.

RATE OF GOLD RECOVERY

A summary of test behavior is tabulated in Figure 4 and discussed below.

Sunday Zone. Samples D, E, F and G all had similar gold recovery rates. On average, 81 percent of recoverable gold (55 percent of contained gold) was recovered by day 10 onto the carbon. Between days 10 and 24, an additional 6 percent of recoverable gold (4 percent of contained gold) was recovered onto the carbon. Between days 24 and 107, an additional 13 percent of recoverable gold (9 percent of contained gold) was recovered onto the carbon.

Sample B showed slow, but similar, overall recovery as the other Sunday Zone samples. After 10 days, 45 percent of recoverable gold (31 percent of contained gold) was recovered onto the carbon. Between days 10 and 24, the test produced an additional 22 percent of recoverable gold (16 percent of contained gold); and between days 24 and 107, an additional 33 percent of recoverable gold (23 percent contained gold).

Samples A and K had chemical problems with leaching that caused delayed gold recoveries. The history of these tests is discussed elsewhere.

Dakota Maid. All the Dakota Maid samples behaved similarly, except for H which had an initial delay in gold recovery due to chemical problems. On average, 52 percent of total recoverable gold (39 percent of contained gold) was recovered by day 10. Between days 10 and 24 and additional 35 percent of recoverable gold (12 percent of contained gold) was recovered onto the carbon. Between days 24 and 107 an additional 13 percent of recoverable gold (7 percent of contained gold) was recovered onto the carbon.

SOLUTION CLARITY AND COLOR

Sunday Zone. Initial solutions from all samples were clear and colorless, with the exception of samples A, B and K.

Initial solution from sample B was cloudy. Initial solution from K was clear with a slight green tint. Initial solution from sample A was clear and purple and remained this color throughout the remainder of the test.

Dakota Maid Zone. Initial solutions from samples H, I and J were all clear and blue. Solutions in these tests became slightly yellow after pH became alkaline and remained so throughout the tests.

Initial solution from sample B was clear and brown while sample L was clear and colorless.

TEST HISTORIES

The twelve tests, seven on samples from the R-2 level of the Sunday Zone, and five on samples from the Dakota Maid Zone, were all run on 5/8-inch rock. A summary of test histories is tabulated in Figure 4 and discussed below.

Start-up of Tests. The initial leach solution for all tests consisted of 16 liters of solution containing 1.0 grams NaCN per liter and 0.50 grams $Ca(OH)_2$ per liter. Initial solutions exiting tests varied in pH and NaCN and are discussed elsewhere in this report.

Sunday Zone Sample A had an initial solution that was clear, lavender purple with an acidic pH. Solution throughout the entire test remained purple (cause of the strong purple color was not determined). Solution became alkaline by day 4 after adding the equivalent of 2.4 lbs/ton lime. Copper content of the test solution was above 700 ppm by day 37. After addition of excess cyanide on day 41, copper content climbed to 1200 ppm by day 68, equivalent to 1.5 pounds copper dissolved per ton of ore. Low gold recovery early in the test was probably a function of the high copper content of leach solution, which serves to complex available cyanide and keep it from dissolving gold.

Sunday Zone Sample B had an initial solution that was murky brown in color with an acidic pH. Solution became alkaline by day 4 after adding the equivalent of 2.9 lbs/ton of lime. Copper content of the leach solution was negligible: 70 ppm by day 58.

Sunday Zone Sample K had an initial solution that was light green with an acidic pH. Solution became alkaline on day 4 after adding the equivalent of 2.4 lbs/ton lime. Copper content of the leach solution was above 700 ppm by day 37. After addition of excess cyanide on day 41, copper content climbed abruptly to 1800 ppm, equivalent to 2.1 pounds copper dissolved per ton of ore.

Initial gold recovery was slow; 30 percent of recoverable gold (16 percent of contained gold) was recovered through the second carbon period on day 26. During the third carbon period, in which excess cyanide was added, an additional 52 percent of recoverable gold (38 percent of contained gold) was recovered. The test was allowed to run through a fourth carbon period and ended after 281 days. An additional 17.7 percent of recoverable gold (13 percent of contained gold) was recovered onto the C-4 carbon.

Dakota Maid Zone Sample H solutions had an acidic pH of 5.2 and a blue precipitate (ferric ferrocyanide). After adding the equivalent of 4.2 lbs/ton lime, solutions became alkaline on day 6. Copper content of the test solution was moderate: 200 ppm by day 58. [NOTE: This sample was taken from same location as 1978 mini-bulk sample DM-5 which had recovery of 28.5 percent.]

Dakota Maid Zone Sample J initial solutions were also acidic and dark blue in color. After the addition of 3.1 lbs/ton lime, solutions became alkaline on day 6. Copper in solution was low, only 14.5 ppm by day 58.

Dakota Maid Samples C and I both had marginal recoveries of 50 and 46 percent respectively, however, calculated head assays were only 0.020 and 0.011 oz/ton gold, respectively.

Dakota Maid Zone Sample L leached well without any problems, and with 88 percent of recoverable gold (74 percent of contained gold) recovered by day 9.

FIGURE 4. SUMMARY OF BUCKET TEST HISTORIES

(See also Figure 6 for overall lime and cyanide consumption)

SAMPLE NO.	LIME ADDED TO ACHIEVE ALKALINITY (lbs $Ca(OH)_2$ per ton)	FINAL COPPER CONTENT OF SOLUTION ppm	INITIAL SOLUTION COLOR	FINAL SOLUTION COLOR	HIGHEST "TARGET" LEVEL OF NaCN IN SOLUTION gpl	% OF TOTAL GOLD RECOVERED (Based on 100 Percent) By Day 10	By Day 24
773 A	2.43	1250	Murky	Purple	9.70	30.0	65.9
773 B	2.85	71	Murky		.76	44.7	67.3
773 C	.76	2	Brown		.78	72.7	88.5
773 D	.94	11	Clear		.98	90.2	96.5
773 E	.87	20	Clear		.92	90.1	97.1
773 F	1.00	7	Clear		.87	52.3	87.1
773 G	1.10	4	Clear		.85	88.7	96.0
773 H	4.23	206	Blue		.76	33.5	72.6
773 I	5.31	28	Blue		.79	62.8	82.8
773 J	2.31	14	Blue		.80	78.3	96.3
773 K	2.37	2200	Green		11.75	15.55	30.1
773 L	.71	7	Clear		.81	87.7	97.2

GOLD AND SILVER RECOVERIES

Figure 5 tabulates gold and silver recoveries from the bucket leach tests. The data is tabulated in actual milligrams gold or silver per sample, and can be converted to oz/ton by reference to the sample weights shown in Figure 5.

In Figure 3, fineness of recovered gold (ratio of gold to gold plus silver, times 1000) was shown for agitated tests on pulverized samples, and averaged 437 fine. Figure 5 shows an average fineness of 619 for the same samples, leached at 5/8-inch in bucket leach tests.

Gold recoveries and head grades are shown in bar chart form, in Figure 2.

TAILINGS ASSAY AND METALLURGICAL BALANCES

At the end of the tests, the test tailings were dried and then screened into various size fractions. The size fractions were crushed, if necessary, to 100 percent minus 6 mesh, and then a portion was split out to be pulverized. Duplicate fire assays were run on the pulverized material. Average tailings assays are reported in Figure 6.

Metallurgical balances for the 12 tests are shown in Figure 7. Seven of the 12 tests showed higher assay heads than calculated heads, three showed the reverse, two showed calculated heads identical with assay heads. Overall metallurgical balance was 91.5 percent, and nine of the twelve tests are considered to have shown moderate or close correlation. The noise in the metallurgical balance calculation is to be expected because of the coarse size (5/8-inch) of rock used for the tests, and because of the occurance of coarse gold in the Gilt Edge ores. The calculated head, based on actual recoveries and assays of the fine-crushed tailings, is considered more accurate than assay head.

FIGURE 5. BUCKET LEACH TESTS

CARBON RECOVERIES AND GOLD FINENESS

SAMPLE NO.	MILLIGRAMS GOLD/SILVER RECOVERED ONTO CARBON DAY 10	DAY 24	DAY 107	DAY 281	TOTAL	MILLIGRAMS GOLD IN ORE TAILINGS	TOTAL CALC. MG. GOLD IN SAMPLE	FINENESS OF RECOVERED GOLD
773 A	7.62/ 4.52	9.14/ 3.72	8.67/ 2.17		25.43/10.41	11.01	36.44	709
773 B	11.06/ 1.12	5.60/ 1.92	8.08/ 0.00		27.74/ 3.04	10.42	35.16	901
773 C	5.14/51.74	1.12/22.04	.81/15.62		7.07/89.40	7.03	14.10	73
773 D	13.60/ 1.58	.94/ .32	.53/ 0.00		15.07/ 1.90	3.85	18.92	888
773 E	4.38/ .46	.34/ .18	.14/ 0.00		4.86/ .64	5.01	9.87	884
773 F	5.98/ 1.10	3.98/ .38	1.48/ 0.00		11.44/ 1.48	4.94	16.38	885
773 G	10.32/ .70	.84/ .48	.47/ 0.00		11.63/ 1.18	4.04	15.67	908
773 H	24.14/35.10	28.16/65.68	19.75/78.01		72.05/178.79	48.03	120.08	287
773 I	2.38/40.40	0.76/14.98	.65/ 1.99		3.79/57.37	4.43	8.22	62
773 J	24.28/70.26	5.58/32.14	1.14/ 4.86		31.00/107.56	34.74	65.74	224
773 K	4.10/ 1.94	3.38/ 1.44	13.83/ 2.09	4.68/ 3.11	26.49/ 8.58	22.65	49.14	755
773 L	18.32/ 2.64	2.00/ .96	.58/ 0.00		20.90/ 3.60	3.72	24.62	853

FIGURE 6. GILT EDGE MINI-BULK SAMPLES

BUCKET LEACH TEST - TAILINGS ASSAYS AND REAGENT CONSUMPTION

SAMPLE NO.	CALC. HEAD ASSAY oz Au/ton	+½"	- ½"+3m	-3+10m	-10+65m	-65+150m	-150m	TOTAL	POUNDS/SHORT TON LIME AND CYANIDE CONSUMPTION $Ca(OH)_2$	NaCN
773 A	0.056	3118	8008	5276	2075	189	225	18,891	6.08	23.10
		0.020	0.018	0.028	0.028	0.028	0.024	0.017		
773 B	0.061	2985	7095	4225	1945	231	401	16,882	7.86	7.14
		0.014	0.016	0.026	0.012	0.018	0.022	0.018		
773 C	0.020	4295	9260	4370	2026	232	325	20,508	6.50	6.17
		0.016	0.003	0.016	0.014	0.010	0.014	0.010		
773 D	0.034	2010	8658	2845	1850	240	445	16,048	2.11	4.93
		0.012	0.003	0.010	0.010	0.022	0.018	0.007		
773 E	0.016	1775	8655	5265	1985	245	350	18,275	2.62	4.15
		0.014	0.010	None	0.016	None	0.012	0.008		
773 F	0.030	795	6453	5530	2540	408	295	16,021	7.48	6.23
		0.010	0.010	0.010	None	0.022	0.020	0.009		
773 G	0.031	2055	6528	3950	1685	203	308	14,729	3.45	5.66
		0.003	0.010	0.003	0.012	0.003	0.036	0.008		
773 H	0.192	2305	8733	4747	1803	242	366	18,196	9.63	6.67
		0.054	0.078	0.068	0.096	0.152	0.054	0.077		
773 I	0.011	4250	9230	4355	2875	335	495	21,540	11.60	6.17
		0.012	0.003	0.003	0.010	0.010	0.003	0.006		
773 J	0.091	3380	9108	4960	2568	530	565	21,111	5.40	6.18
		0.012	0.024	0.044	0.124	0.198	0.188	0.048		
773 K	0.072	4450	8055	4805	1992	302	423	20,027	4.95	28.32
		0.067	0.021	0.026	0.025	0.036	0.033	0.033		
773 L	0.033	2542	8878	6713	3082	251	240	21,706	2.04	4.61
		0.003	0.010	None	0.003	None	None	0.005		

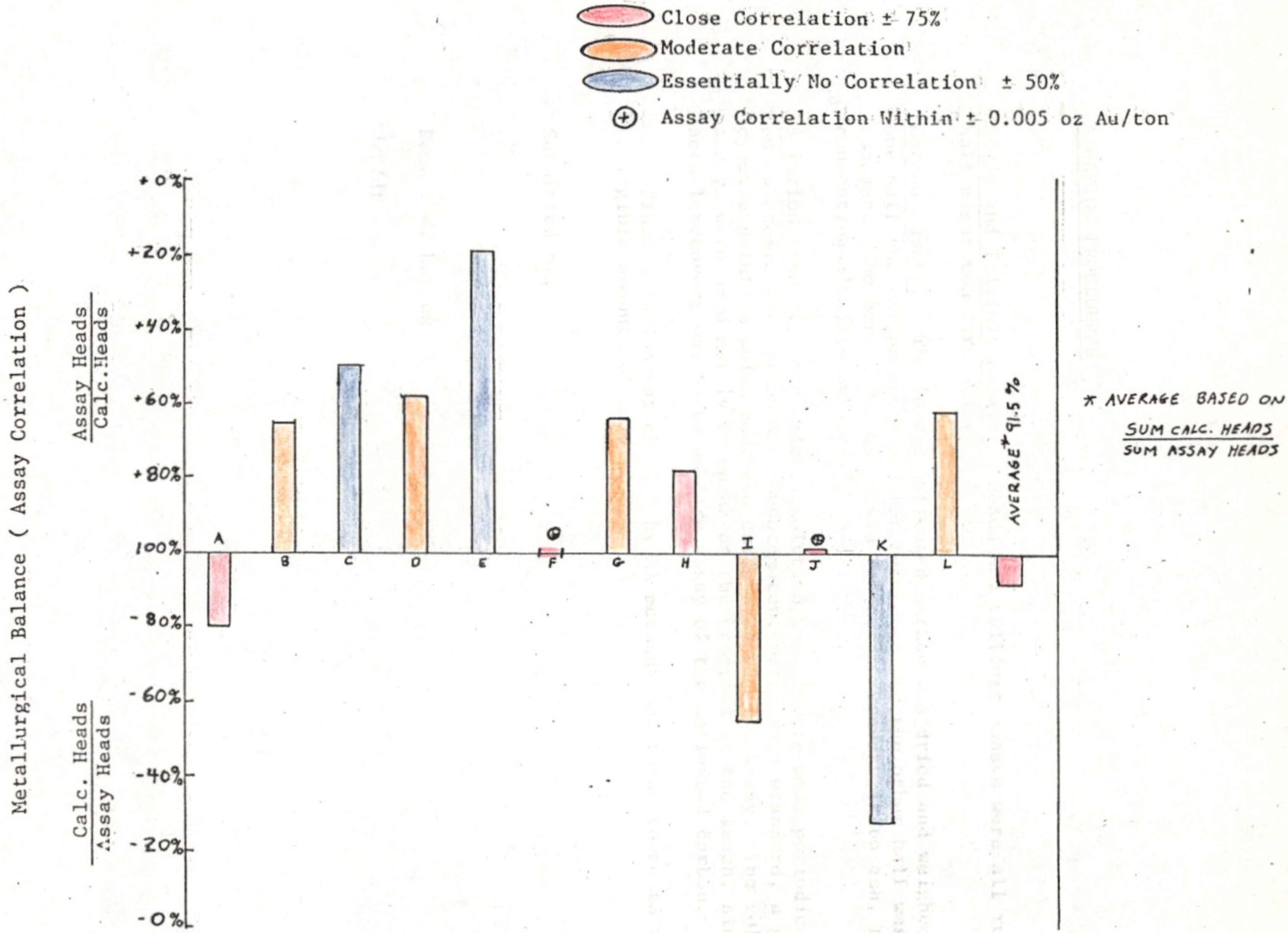


FIGURE 7. GILT EDGE MINI-BULK SAMPLES
12 BUCKET TESTS ON -5/8" ORE
METALLURGICAL BALANCES

ASSAYING PROCEDURES

Heads and Tailings Assays. Heads and tailings assays were all run as half assay ton fire assays.

Carbon Assays. The loaded activated carbon was dried and weighed. One half the carbon was saved for reference and the other half was assayed. The carbon for assay was roasted to convert it to ash, then conventionally fire assayed.

Solution Assays. Approximate solution assays were made periodically on an atomic absorption spectophotometer, using as a standard, a gold cyanide solution which had been calibrated by fire assay. The solution assays were used merely to check on the progress of the leach, since actual recovery was based on fire assay of the activated carbon.

Final solution was checked by AA methods and found to contain negligible amounts of gold.

Submitted by,

Daniel W. Kappes

Daniel W. Kappes

DWK/df